SCIENCE AND INDUSTRY

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Contractors and Engineers Monthly

Vol. 40, No. 2 FEBRUARY, 1943 $2 a Year, 20 Cents a Copy

Highlights Of This Issue

Construction for the Army

Feature articles in this issue describe three different types of construction projects for the U. S. Army. The first deals with the form work and concreting for storage warehouses at an Army Depot; the second, hot-mix paving at a new Army airport in the middle west; and the third, earth and rock work to clear areas for 1,200 x 180-foot QM warehouses. See pages 1, 2 and 37.

Army Access Roads

The only type of highway construction now permitted is on access roads or roads judged to be absolutely essential to the war effort. Two such projects are described in this issue: a 9-mile rock-asphalt surfacing job on a new military highway near San Antonio, Texas; and the concrete paving methods used on a concrete access road in Missouri. See pages 1 and 9.

Care of Equipment

Continuing our series of articles on the care of equipment and parts to extend their working life, this issue offers a description of the care and repair of equipment in the well-laid-out State Highway Commission Division shops and garage in Topeka, Kansas; and also some helpful hints on the care of rubber belts. See pages 13 and 40.

National Award Winner

The work of the Middle West Roads Co., winner of the Central Section and National Awards in our 1941-42 Roadside Development Awards, on a 3.11-mile highway project in Ohio is described in this issue. See page 19.

Highway Maintenance

With the increasing emphasis on highway maintenance to keep our present highway system functioning properly, the activities of maintenance forces assume greater importance. Highway maintenance in Wyoming and Connecticut's annual tar surface-treatment program are described in this issue. See pages 24 and 33.

IN THIS ISSUE

Courtesy, RCA Mfg. Co.

Rock-Asphalt Top For Military Road

Colglazier & Hoff First Reconditioned Grade and Then Spread Top Material; Laid 350 Tons a Day

✦ THE use of a 12-ton roller for compacting the top of a rock-asphalt road exceeds Texas specifications, which require 3 to 6-ton roller for compaction and a 10-ton unit for finish-rolling. L. A. Ferguson, Superintendent for Colglazier & Hoff of San Antonio, Texas, felt that he could produce a better consolidated and smoother surface by using a 12-ton machine for finish-rolling. This was done on a 9-mile surfacing job on a new military road near San Antonio. The results were most satisfactory.

This section had been graded some

(Concluded on page 12)

Rolling Forms Speed Construction of New Concrete Warehouses

Needed Storage at Army Depot Provided by Fast Production-Line Methods Set Up by Contractor

✦ THE old adage "Practice makes perfect" is again exemplified in the speedy construction of over 1,100,000 square feet of storage at an enlarged Army Depot. Completion of two earlier contracts of 1,400,000 square feet of storage at the same Depot had given the contractor experience leading to the training of carpenters in handling the forms and of crews of steel workers for the complicated reinforcing, and concrete crews who knew the "how and when". This resulted in real production-line methods, with every man doing his specialized job repeatedly and faster as the work progressed.

Six sets of forms permitted a daily pour of four barrels or one unit 181 feet 8 inches overall width and 80 feet long. One set of forms was required for the pour, one for curing, one being stripped, two in place for setting the reinforcing steel and one set was left for placing the forms for the main frames on the roof. The barrel-roof construction with a 3½-inch reinforced-concrete shell supported on columns is a patented design of Roberts & Schaefer Co. of Chicago, from which a considerable number of projects have been built by the Corbetta Construction Co. of New York.

Design

The spans of the barrels as built at this Depot are 45 feet 3 inches on centers, supported by 24-inch square interior columns and 21 x 24-inch exterior columns, all spaced 40 feet on centers. On the canopy side of the structure, intermediate exterior columns are spaced at 20-foot intervals. The feature of this construction is that the roof is a continuous unit 80 feet long, having a 20-foot overhang on each end, with expansion joints at the ends, 1-foot 6-inch main frames over the main columns, and 8-inch stiffening ribs at the expansion joints. The method of construction permitted pouring the individual barrels at one time, followed by the pouring of the crickets between the barrels two days later.

This design repeated permits the construction of a warehouse 181 feet 8 inches wide with but three rows of interior columns and of indefinite length. For the project described, the warehouses provide 1,100,000 square feet of floor area with only 51,692 cubic yards of concrete and 3,590 tons of reinforcing steel. The curtain walls at the sides and ends are of concrete block.

Preliminary Work

After excavating and grading, the contractor set the forms for the column footings. These average 7 x 11 feet with the pedestal carried to the finished floor line. Then the column forms were set and the columns poured ahead of the setting of the forms for the barrels. The column forms are ⅝-inch plywood with 2 x 4-inch backing and Baker-Roos column clamps.

The next work was to set the rails for carrying the roof forms. These were carefully set on temporary ties and wedged to get the required grade. Careful attention to this feature was necessary to insure the accuracy of the setting of the forms when they were placed on the rails. The contractor designed a special carriage for transporting one-quarter of an 80-foot section of form one barrel wide from one site to another within the reservation. This saved the labor and time required for breaking up a form and assembling it again, and prevented possible damage to the plywood.

Forms Set and Moved Ahead

The forms were not small affairs, as the top of the arch is 22 feet 6 inches above the finished floor line. They were built up with careful thought to permanence and assembled with Teco connectors to insure tight joints throughout. The original assembly was so good that the sets of forms in use at the ware-

(Concluded on page 6)

MAINTENANCE MUST GO ON

C. & E. M. Photo

A loaded sand truck driving over the conveyor belt of a Connecticut front-end spreader. See page 33.

Anderson Ranch Dam

Unwatering and Foundation, Cut-Off Walls and Grouting

Dam Site in Southwestern Idaho Unwatered by Shafts, Wellpoints, Well Holes and By Direct Pumping

✦ THE unwatering of the site of Anderson Ranch Dam at the bottom of a deep canyon formed by the South Fork of the Boise River about 52 miles southwest of Boise, Idaho, presented several problems to Morrison-Shea-Twaits-Winston, contractors for this $10,000,000 project. Initial unwatering was attempted with shafts and infiltration tunnels, followed by wellpoints as the 135-foot deep cut-off trench was excavated, and finally well holes to intercept a fairly large underground flow from a nearby creek. Surface water and ground water that reached the various sumps were lifted by various types of pumps spotted over the foundation area.

Infiltration Tunnels

Two shafts were sunk, one upstream and one downstream of the cut-off trench, to a depth of about 160 feet and with a cross-section area of 6 x 12 feet. From these, 6 x 6-foot tunnels were driven for 200 feet from the upstream shaft and 250 feet from the downstream shaft out under the river channel in rock. Then holes were drilled by jackhammers up through the overlying rock to provide infiltration for drainage of the river bed. The total amount of water pumped from the foundation excavation was between 5 and 6 second-feet. Bingham Pump Co. totally enclosed submersible pumps were lowered into the shafts for removing the infiltrating water.

Wellpoint System

To dry up the slopes of the fine sand as the excavation went down, the contractor used a maximum of 300 Complete wellpoints at one time and smaller numbers as the ground water flow lessened. At maximum flow through the 2-inch wellpoints, four Complete wellpoint pumps were in operation, with two boosters to lift the water over the top of the canyon to the diversion tunnel. A 4-inch pipe from the wellpoints flowed full to the sump from which the boosters took suction. Toward the end of the wellpoint operation, but with the remaining points still spaced 2½ feet apart, three of the wellpoint pumps were operated with the two boosters.

Considerable flow of ground water still persisted at one corner of the excavation just below the stream bed of a small creek. In an endeavor to stop this by tapping the flow underground, the contractor drilled several 12-inch well holes and put pumps on them. The flow still persisted from this source and was allowed to run to sumps at the bottom of the excavation. One of the Complete wellpoint pumps was used to remove this water, with two Cameron electric-driven pumps as standby units.

At other sumps farther downstream three Bingham sump pumps were used, a Cameron pump, and a group of Byron Jackson centrifugal sump pumps was installed.

(*Concluded on page 7*)

C. & E. M. Photo
A Model CP5 diamond drill running grout holes in hard rock.

Grouting at 50 to 200 Pounds Done Fast, Cut-off Wall Forms Built in Place, Concrete Pumped to Forms

✦ GROUTING of the foundation of Anderson Ranch Dam on the South Fork of the Boise River in Idaho was done by the stage method at progressive depths of 20, 50 and 150 feet below the base of the cut-off walls. The foundation rock was generally tight, taking an average of only one sack of cement per foot of hole, but one hole went to 1,200 sacks. The grout varied from 5 to 1 down to 1 to 1 by volume and the pressures from 50 pounds to 200 pounds.

The cut-off wall forms were originally planned for panel construction in order to speed erection but the irregularity of the ground along the canyon walls prevented carrying out this scheme. A double-acting Pumpcrete delivering 60 cubic yards per hour was used as the initial pump with a single-acting Pumpcrete 120 as a booster on the line.

Drilling Grout Holes

The grout holes were drilled 10 feet apart and 30 to 150 feet below the base of the cut-off walls. The 1⅜-inch holes were drilled by diamond drills. Since the bottom of the cut-off trench was 135 feet below ground elevation, the holes were drilled to a considerable depth for the sake of the safety of the foundation. O[ne] of the new Chicago-Pneumatic CP5 d[ia]mond drills was used with great succ[ess] on this job, getting 10 feet per hour [in] the hard rock. Drilling was also done [by] two Boyles Bros. BBU Jr. diamond dri[lls]

C. & E. M. Photo
Wetting down the forms for the upstream wall on the right abutment of Anderson Ranch Dam.

Grout Pumps

The grout pumps were located ab[out] two-thirds of the way down the cut-[off] trench excavation, making it necessa[ry] to chute the cement sacks on a "mon[key] slide" down to the pumping outfits. T[wo] mortar mixers of the spiral-blade t[ype] were used as grout mixers, delivering [to] oil drums equipped with agitators [to] keep the grout constantly in suspensi[on]

The battery of grout pumps consis[ted] of a Gardner-Denver 2BG6 10 x 3 x [10]-inch duplex pump operated by c[om]pressed air from the compressor ho[use] and three other pumps of the same ty[pe] one 10 x 4 x 10-inch and two 6 x 3 x [6]-inch. These pumps delivered the gr[out] to the line at pressures from 50 to [200] pounds per square inch as required.

Stage Grouting

All of the grouting was done in stag[es] with the initial holes drilled 40 feet ap[art] and to a depth of about 20 feet. T[he] grouting of a minimum of four of th[ese] holes was completed with a pressure [of] 40 to 50 pounds and then within 4 hou[rs] the holes were cleaned out. Next w[ork] was started on the intermediate hol[es] spaced 20 feet apart, with the same m[eth]od of grouting. Following the cleani[ng] out of these holes the 10-foot spac[ed] holes were grouted and finally cleane[d]. If an excessive amount of grout was u[sed] in any section or group of holes, th[e] whole operation was repeated with ho[les] spaced 5 feet apart, but this was not n[ec]essary except in isolated cases.

Starting again with the 20-foot spac[ed] holes, the operation was repeated t[o] depth of about 50 feet, grouting a[t] pressure usually not higher than [100] pounds. The last stage was grouting [the] 40-foot spaced holes to a depth usually [of] 150 feet when the rock had shown its[elf] rather tight, but if there had been [an] excessive take in any group this st[age] depth was limited to 100 feet, then [the] hole was further drilled and grou[ted] to 150 feet.

The Compressor House

The contractors' compressor house, [lo]cated centrally on the job, contained t[wo] Ingersoll-Rand Imperial-type 1,300-[cfm] compressors, and one Sullivan 1,050-[cfm] compressor to furnish air for all ope[ra]tions throughout the job where air li[nes] were economical. In the house also [was] a standby diesel-electric unit of 500-[kw] capacity to handle the electric pumps

(*Concluded on page 25*)

New Airport Runways Paved With Hot-Mix

Pair of Pugmills Furnished 100 Tons of Binder or Top Per Hour for Spreading in 10-Foot Strips

✦ ALL speed possible, with careful production of aggregate, proper batching and mixing of binder and top, and uniform spreading and rolling, marked the paving of the runways at a new air field in the middle west, to insure completion before the air forces assigned to the post arrived. Good organization made possible the laying of 9,000 feet of a 10-foot binder strip in 10 hours, or 18,000 feet of top in the same time.

Storing the Materials

To supply the aggregates needed for the paving of these extensive runways, the contractor installed a Pioneer crushing plant in a pit 3 miles from the air field. Binder gravel from 1¼-inch to 200-mesh screen sizes and top aggregates from ⅜-inch to 200-mesh were produced. These were trucked to the area adjacent to the plant and stockpiled.

The limestone dust, 200-mesh filler, was trucked in from a commercial producer and stored in a shed adjacent to the dust elevator. The asphalt was delivered by the producer to a siding 14 miles distant from the plant and hauled in tank trucks to the plant where a 20,000 and a 15,000-gallon heated tank were provided for storage. A Kinney steam-jacketed pump transferred the material from the tank trucks to storage and a second was used for delivery of the asphalt from the tanks to the plant weigh kettles through a circulating loop. A 150-hp horizontal boiler fired by a fuel-oil torch supplied the steam for plant needs.

C. & E. M. Photo
The asphalt plant for producing the hot-mix binder and top course for two runways at a midwest Army airport. The asphalt storage tanks are at the left, then twin driers, the Vortex dust collector, bins, pug mixer and filler elevator.

The Hot-Mix Plant

A Northwest crane with a Blaw-Knox ¾-yard clamshell bucket was used to move the aggregates from the stockpiles to the feeding hopper where a plate feeder moved the material into a chute leading to the cold elevator. The entire hot-mix plant was electrically operated. A pair of Caterpillar D13,000 diesel engines with V-belt drive to a 150-kw General Electric generator furnished the power for operation. There was a separate 5-hp motor for the feeder, a 10-hp motor for the cold elevator, and a 20-hp motor for the hot elevator. Two 30-hp Allis-Chalmers motors with V-belt drives provided power for the twin driers, also a product of the Allis-Chalmers Mfg. Co. These driers were 5 feet in diameter

(*Concluded on page 30*)

Cheyenne's oldest pavement

Holds its own after 20 years' service

A 20-year-old TEXACO Sheet Asphalt pavement serves Capitol Avenue, Cheyenne, Wyo. (Small photo shows the State Capitol Building, which stands at one end of this TEXACO paved street.)

TWENTY YEARS AGO the city of Cheyenne, Wyo., set up its first Paving District, consisting of Capitol Avenue and 18th Street. Both these important thoroughfares were paved with TEXACO Sheet Asphalt.

After 1923, one Paving District followed another in Cheyenne, until today a large part of the city's street system is hard-surfaced.

To the engineer looking for facts which are helpful in gauging a pavement's durability, here's a significant comparison: While many thousand square yards of Cheyenne's newer paving (not Texaco) has had to be retreated or resurfaced, the TEXACO Sheet Asphalt laid 20 years ago is still intact, having required neither retreatment nor resurfacing.

Today's war restrictions on street paving and maintenance are causing hundreds of other cities to appreciate more than ever the durability and low upkeep of their TEXACO-paved streets.

THE TEXAS COMPANY, *Asphalt Sales Dept.*, 135 East 42nd St., New York City

Boston Philadelphia Richmond Chicago Jacksonville Houston

TEXACO REG. T. M.

TEXACO ASPHALT

Contractors and Engineers Monthly

THE NATIONAL BUSINESS PAPER FOR CIVIL ENGINEERING
CONTRACTORS AND HIGHWAY ENGINEERS AND COMMISSIONERS

Member of Controlled Circulation Audit

Issued Monthly by Buttenheim-Dix Publishing Corp.
Editorial and Business Office: 470 Fourth Ave., New York City
Printed in Mount Morris, Ill., U. S. A.

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What Do You Mean—Public Relations?

Public relations are the contacts of an organization with the public. They are not just getting stories or photographs into the newspapers, nor are they even a paid advertising campaign. Public relations are an integral part of every activity, and every organization has them, good or bad. Every act of a highway department or of any of its representatives is either good or harmful public relations. *Good* public relations are the favorable impression carried away by the public, the taxpayers, as a result of courtesy, consideration, and accurate information.

State and county highway departments are right now faced with a real challenge in public relations. Despite gasoline and tire rationing, a certain portion of the public will still be driving over our highways—but, due to the necessity for concentrating on war production, many of those highways will be in poorer condition than the traveling public has been in the habit of enduring. It is up to the highway departments, first, to keep our highways in as good condition as possible within the limitations and restrictions forced upon us by the war effort; secondly, they must warn highway users by signs of danger spots and sections unsuited for heavy traffic.

In his recent book *Traffic Accidents and Congestion,* Maxwell Halsey makes an interesting comment on traffic warning signs, such as "Dangerous Intersection", "Travel at Your Own Risk", and "Slippery When Wet". Mr. Halsey points out that such signs advertise to the public what may be mistaken as incompetency on the part of the highway department, instead of lack of materials or funds to make the necessary improvements.

Because public relations is so important a factor in the solution of traffic problems and in insuring adequate future funds for highway construction, there is an important psychological point in Mr. Halsey's statement. Under conditions where a motorist expects safe and adequate highways, and not merely structural support, it is fundamentally unwise to use such signs as are quoted above, Mr. Halsey says.

Obviously the ideal solution to the problem would be to correct the conditions which make these signs necessary. Since this is not possible, the second best solution is to replace such signs with others not having such a negative public relations value. If a highway is in poor condition because wartime restrictions prevent its improvement, why not have your sign explain that fact, thus informing the public that the highway department is aware that the highway should be better than it is, and putting it up to the public that the condition results from the contributions which we as a nation are making to Victory.

It is the public's right to know why hazardous conditions exist. If such conditions exist because of gas-tax diversion in the past, it is particularly important for the public to be informed that it is being subjected to hazards and inconvenience because the money they paid in gas taxes for highway purposes was diverted by politicians to non-highway uses. Such information before the public *now* may well help prevent such diversion in the peaceful future, when all our gas-tax money will be needed to recondition our highway system.

Public Relations and Maintenance Men

For a considerable period, the burden of good public relations for the highway organizations of this country will rest squarely on the shoulders of the maintenance departments. The work of maintenance crews on the road will more than ever vitally affect the traveling public. Their barricades at patching operations will take the place of detour signs, as their work is expanded and increases in importance.

Highway departments will inevitably be subjected to much criticism for the condition of this road or that. Therefore, it is of more importance than ever that judgement, courtesy and an understanding approach be part of the field equipment of every maintenance man. His job is no easy one. He will be called upon to barricade longer sections of the heavily traveled main roads, and the more important the artery, the greater will be the number of barricades with attendant one-way traffic. Therefore, care in the selection of the flagman is probably one of the first requisites of good maintenance public relations. Give him careful instructions on how to use his red flag and be sure that he knows that frantic waving of the flag means nothing. Display it and stop traffic; drop it and motion traffic ahead with the other hand.

The foreman should take greater care in the distribution of maintenance equipment along the roadside so as to cause minimum interference with traffic. He can be helpful when discussing his problems with motorists, truck and passenger, who may be delayed by his activities.

Remember that favorable public opinion may be made or destroyed by these seemingly minor contacts along the road, and the accumulated good will of good public relations may mean the difference between passing, or another failure to enact, an anti-diversion or some other much-needed highway bill in the future.

Highway Equipment For "Active Service"

With the reports that the War Production Board was acquiring a considerable amount of state and county highway department crawler-mounted equipment for export under Lend-Lease and for the Armed Forces, we made inquiry to learn the extent to which this would be carried and what effect it might have upon the necessary road maintenance operations of our state and county highway departments.

The Governmental Division of the War Production Board made a survey of all construction equipment owned by states, counties, cities and towns, for use on all highways and streets. The Construction Machinery Division, under the L-196 Order, has also made a survey of all similar equipment, privately owned as well as governmental.

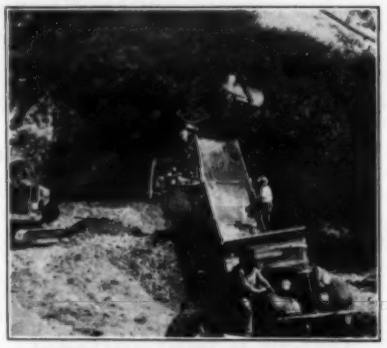
Due to the critical materials involved in the manufacture of this class of equipment, it is evident that the less volume manufactured, the more critical materials will be made available for direct war purchases.

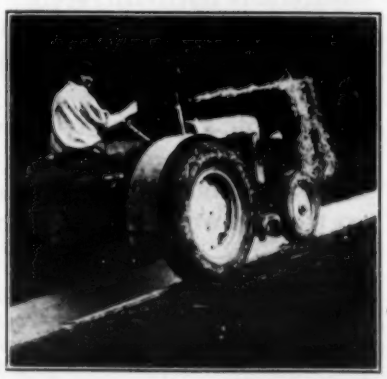
"With this in mind", reports Louis Levenson, Maintenance Machinery Section of the Governmental Division, Maury Maverick, Director, "the Used Construction Machinery Section of the Construction Machinery Division and the Maintenance Machinery Section, are working to put into use all machines that are now in the field. It is impossible to estimate the amount of this equipment that governmental agencies will be called upon to rent or sell, but you can rest assured that they will only be asked for such machines as we feel will not be necessary for the construction or maintenance of such roads as are necessary for our war efforts."

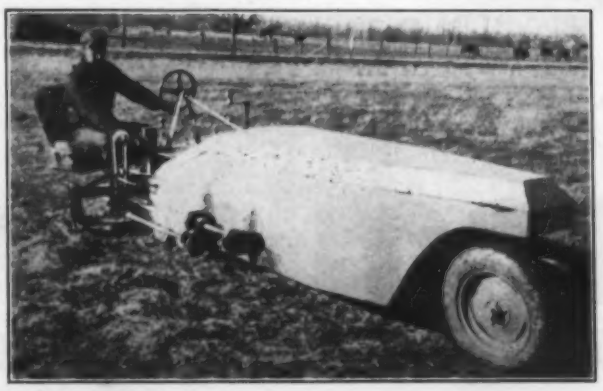
"If we'd only taken better care of our snow plows!"

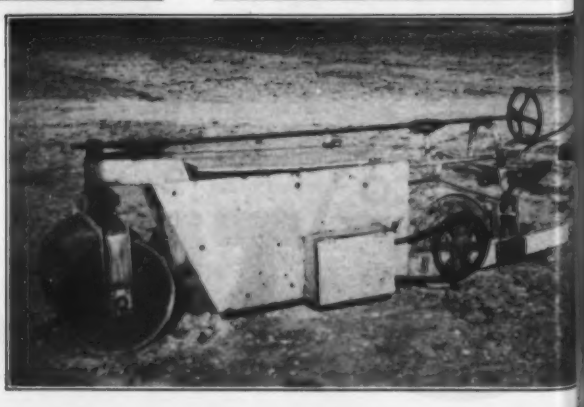
Handling of Roadside Items Merits Award

Scenes on the Middle West Roads Co. highway contract on U. S. 50 in Hamilton County, Ohio, for which it won the National Award in CONTRACTORS AND ENGINEERS MONTHLY's 1941-42 Roadside Development Awards. Starting at the top and reading left to right, the photos show: the special unit for screening topsoil and grading stones which were used for tree aeration and protection, as shown next; hauling straw to the top of a 70-foot slope by means of a special rig on a Silver King tractor, which straddled the concrete intercepting ditch when hauling; hand-spreading the straw for the mulch on small cut slopes; the Gledhill sod cutter used by the subcontractor on sodding; the power-driven sod roller developed by Joseph Kroeger, sodding subcontractor. **See page 19.**









Road Specification Emergency Revisions

Recommendation No. 61 of the Petroleum Coordinator for War, as approved by the War Production Board, limiting the number of asphalt grades, has made necessary certain changes in the various construction specifications of The Asphalt Institute, 801 Second Ave., New York, N. Y. These specifications have been issued in pamphlet form with the title, "Construction Series No. 67—Emergency Revisions of The Asphalt Institute Construction Specifications."

Copies of this pamphlet are available, without charge, upon request to The Asphalt Institute, 801 Second Ave., New York, N. Y.

Hardesty Joins Armco

The R. Hardesty Mfg. Co., of Denver, Colo., has become the Hardesty Division of Armco Drainage & Metal Products, Inc., as of December 1, 1942. Hardesty began the manufacture and sale of Armco products shortly after its incorporation in 1899. Its long association with The American Rolling Mill Co. as an independent distributor has culminated in Hardesty's becoming a part of the Armco organization.

The personnel and policies of the Hardesty Division are to remain unchanged. The company sells in Colorado, Wyoming, New Mexico, Utah and Idaho, and has several plants in those states and at El Paso, Texas.

Army-Navy "E" To Hercules

In a letter from the War Department dated December 19, 1942, and signed by Under Secretary of War, Robert P. Patterson, the Hercules Motors Corp., Canton, Ohio, was informed that the Army-Navy "E" award had been granted to the men and women of the corporation for production excellence in the service of the Armed Forces. The presentation was made by Colonel Harold M. Reedall at the Canton plant on January 11.

Speedy Construction Of Army Warehouses

(*Continued from page* 1)

house mentioned have been used practically continuously for 1½ years, except for three months. One of the buildings constructed was 2,162 feet in length.

The form consisted of ⅝-inch plywood with 3 x 8-inch purlins on trusses, the top chords of which were two 2 x 12's cut to radius. The bottom chords were two 2 x 12's and the posts supporting the trusses on the sills were 6 x 6-inch timbers. The diagonal members of the trusses were of 2 x 8's and 2 x 6's as required and all double, as were all the other members of the trusses. The sill was a double 3 x 8 which acted as a carriage for eight double-flange wheels per track. The eleven trusses per 80-foot section of form were braced longitudinally with 1 x 6 and 2 x 4-inch hardwood lumber. There was one double set of trusses at each heavy concrete rib section.

The double-flange wheels permitted the moving of the sections of form ahead on the rails. When they were in position, the entire form was jacked up as one 42 x 80-foot section, with eleven jacks on each side. Four men were required to jack down the forms and then they were pulled ahead to the next pouring position by a tractor.

Reinforcing and Concreting

The steel crew made up a major part of the organization in the construction of these barrels as the reinforcing design is complicated and required a large crew to keep up with the schedule of pouring a set of barrels a day. The reinforcing was all set on 1-inch "high chairs" to insure the proper spacing of the steel from the face of the thin concrete shell. At the top of each barrel a buggy run, consisting of four I-beams tied together, was set, spanning almost the entire width of the four barrels being poured. These were supported on structural steel frames with track running along the barrels so that the entire runway on wheels could be moved the distance of 80 feet that was poured as a unit. The buggy runs consisted of planking 8 feet wide, joined at the tops of the barrels so that when necessary each barrel section could be moved separately.

Concrete for the work was mixed in a MultiFoote 27-E paver at ground level, using dry batches weighed out at a commercial plant near the reservation. The paver was equipped with an inclined boom so that the concrete could be delivered direct to a collecting hopper which fed the 1-yard bottom-dump bucket swung by a Speedcrane with a 60-foot boom. The bucket was emptied into an Insley hopper on the roof at the end of the run. This set-up permitted the ground collecting hopper to take up any slack in the production of concrete by the paver and similarly the roof hopper kept the four steel-wheel buggies running continuously.

The concrete was dumped directly into the forms which carried small wood blocks as guides for the eight masons who worked on a barrel, building up the arched barrel by hand. Aiding them were four laborers shoveling concrete and four men vibrating the concrete as placed, two men to each Mall vibrator. The barrels are thickened at the main frame, the expansion joint ribs, and in the valleys so that it was the responsibility of the masons to build up the correct amount of concrete in every section of the barrel. The final operation was spraying the concrete with Aquastatic as a membrane cure.

After the curing was complete and the valleys had been poured, the entire barrel was given a 3-ply membrane waterproofing with tar. The strength of the concrete, made with Incor high-early-strength cement, ran in the neighborhood of 2,500 pounds in 24 hours which permitted stripping the forms at the end of that period. This added much to the speed with which the warehouses could be run out on the production line.

An outstanding safety measure on the work was the scaffold along the edge of the barrels. With heavy boards to insure a strong safe walkway for the workmen, there was also a 1½-inch inside-diameter pipe post every 10 feet with two heavy steel cables run through holes at the top and mid-height to prevent men falling from the scaffold.

Personnel

This warehouse project was built by contract under the direction of the U. S. Army Engineer Corps. In the interest of national security, the location of and mention of personnel connected with U. S. Army construction are omitted.

Buy U. S. War Bonds regularly.

Inspectors Needed By War Department

Applications for inspector positions in the Production Protective Service of the War Department continue to be accepted by the U. S. Civil Service Commission. The positions are extremely important to the war effort, as the inspectors will function for the protection of some 6,500 major factories engaged in war work. The salaries for these inspector positions range from $2,600 to $5,600 a year, but applications are particularly sought from persons who are qualified for and will accept the salaries of the grades from Junior Inspector at $2,600 to Senior Inspector at $3,800 a year.

Inspectors will be responsible for making recommendations to prevent interruptions or delays in the production and delivery of all types of war material caused by major accidents, explosions or other hazards inherent in manufacturing plants. No written test will be given. Applicants will be rated on their education, experience, and personal qualifications, as soon as possible after the applications are received at the U. S. Civil Service Commission, Washington, D. C.

The requirements are: General experience in performing inspectional and professional engineering advisory services for manufacturers, as inspector in a property insurance rating bureau, as plant protection supervisor or master mechanic in a large industrial establishment, or as professional engineer specializing in plant protection work. Appropriate college study may be substituted for part of the experience.

Applications will be accepted until further notice, but qualified persons are urged to apply immediately unless they are already using their highest skills in war work. Announcements and applications may be obtained at any first or second-class post office or from the U. S. Civil Service Commission in Washington, D. C. War Manpower Commission restrictions on Federal appointments may also be consulted at these offices.

Highway Smoothness And Wear on Tires

The most critical material today is rubber. Every effort must be made to conserve it, even to putting our pride in our pocket and doing without much to which we are accustomed. Our traffic speeds have been cut nationally to 35 mph to conserve rubber, we do not drive our cars unless necessary, and even that has been limited by national gas rationing. What about the effect of the surfaces of our pavements on the wear of rubber tires? We can do little about the existing surfaces and their effects on tire life until it becomes necessary to resurface the pavement. Then comes the choice between a surface that is assuredly non-skid and may cause high tire wear, or one less non-skid and much less damaging to tires.

R. A. Moyer, Research Associate and Professor of Highway Engineering, Iowa State College, presented a paper on highway economics at the Highway Research Board meeting in St. Louis, which sums up the findings of his extensive research project of the past few years on motor vehicle operating costs. It is a matter of common knowledge that of all road surfacing loose gravel offers the greatest resistance to traffic as well as damage to tires. The damage to tires by our higher types of surfaces is far greater than we had generally believed. Professor Moyer's report contains much pertinent information on this subject for consideration under our present unusual economic conditions.

The chat-rock surface used so generally on bituminous roads for non-skid purposes, and the broomed portland-cement concrete surface accepted as standard for safety in that type of construction, produce the highest tire wear of all surfaces. Both are highly acceptable for their non-skid qualities, but both are highly destructive of our now invaluable tire treads. Loose gravel produces twice the tire wear of the usual type of concrete.

The most satisfactory surface under wartime conditions is produced by an application of 0.3 gallon per square yard of asphalt and 20 pounds per square yard of ⅛ to 1½-inch crushed stone. The tire wear on this surface, according to the extensive tests and measurements during the life of the tests under Professor Moyer's direction, is about one-fifth that of a broomed concrete surface.

Star With Army-Navy "E"

The employees of Broderick & Bascom Rope Co., St. Louis, Mo., have won a renewal star from the Army and Navy because of the continued high record of war production which earned the Army-Navy "E" for them in April, 1942. Describing the company's product as a "strand in the invisible noose which each day is drawing a little tighter around the Axis", Commander W. F. Veatch, Commander of the Sixth Naval Reserve Area, in making the presentation, pointed out that a piece of wire rope "may spell the difference between a smashing victory or a costly defeat".

Work on Foundation For Large Earth Dam

(*Continued from page 2*)

Foundation Excavation

A well-chosen battery of excavating equipment was put into the hole to hasten removal of the sand, and rock as it was blasted out, in the foundation area. A Bucyrus-Monighan 6W with a 150-foot boom, a Bucyrus-Erie 20-B dragline, two Bucyrus-Erie 100-B machines and a 120-B, all electric-driven, were used with a Lima 1201 and a Northwest 80-D for the removal of rock. In the bottom, a Speeder ¾-yard shovel loaded material to a Euclid which carried it up to a spoil pile from which the Monighan could handle it. A Caterpillar D8 tractor and LeTourneau bulldozer aided the equipment in moving large rock as well as small within easier reach of the equipment.

Personnel

The Anderson Ranch Dam is being built under the direction of the Bureau of Reclamation, with John A. Beemer as Construction Engineer, and Ferd Schlapkohl, Office Engineer. The contractors are Morrison-Shea-Twaits-Winston, with V. A. Roberts as Project Manager and William Woodall, General Superintendent. As a result of the WPB order stopping all construction not directly connected with the war, work at Anderson Ranch Dam has ceased for the time being.

New York Moles Awards

The Moles, an organization of men now or formerly engaged in the construction of tunnel, subway, sewer, foundation, marine, subaqueous, or other heavy construction in New York City, at its February 3 Award Dinner presented the Moles Awards for 1943 to Rear Admiral Ben Moreell (CEC) USN, Chief of the Bureau of Yards and Docks, U. S. Navy, and to Frank W. Barnes, assistant general manager, Merritt-Chapman & Scott Corp., for outstanding achievements in the heavy construction field.

The award to Rear Admiral Moreell is in recognition of his work in the direction of naval expansion, involving by far the greatest amount of construction ever undertaken by the Bureau of Yards and Docks. The award to Mr. Barnes is made for the crowning job of his long career in the construction of railroad, hydro-electric, tunnel and other work in this country and abroad, his remarkable handling of construction of an off-shore base and projects in New England for the combined firm of George A. Fuller Co. and Merritt-Chapman & Scott Corp., the organization which built Quonset Point Naval Air Station in eleven months.

Both recipients of the Moles Awards for 1943 are members of the American Society of Civil Engineers and the Society of American Military Engineers.

Wietersen Joins Buda

R. C. Wietersen has been appointed Director of Purchases for The Buda Co., Harvey, Ill., in direct charge of purchases of equipment and materials for Buda gasoline and diesel engines, radial diesel engines, railroad equipment, lifting jacks, Dieselight generator sets, earth drills, and industrial shop trucks.

For the past two years Mr. Wietersen has been Director of Purchases for the National Supply Co., of Springfield, Ohio, manufacturer of Superior engines. For four years prior to that he was with Hercules Motors Co., Canton, Ohio, as Director of Purchases. He spent 18 years with Studebaker Corp., for 10 of which he was Assistant Purchasing Agent.

The new Trojan concrete barrow built of hardwood.

A New Wheelbarrow Made of Hardwood

WPB Order M-126 limited the sale of steel tray wheelbarrows to foundries, smelters and coke producing plants handling hot materials only. Since our readers haul only cold materials in wheelbarrows and thereby will have difficulty in purchasing steel tray wheelbarrows in the future, they will be interested to learn of the new Trojan concrete barrow made of hardwood.

As shown in the illustration, it is designed especially for contractors or builders and is built to stand rugged service in hauling mortar and concrete in limited spaces. It has a capacity of 4 cubic feet struck and weighs only 70 pounds complete with the steel wheel.

Full details and prices will be furnished by the manufacturer, Chattanooga Wheelbarrow Co., Chattanooga, Tenn., to those writing direct and mentioning this text.

Rubber Substitutes For Tire Services

So many questions are raised these days as to the quality of the synthetic rubbers now being made in the United States that we are pleased to give to our readers this concise statement from the paper of R. D. Evans, Manager, Tire Testing Division, Goodyear Tire & Rubber Co., Akron, Ohio, presented at the Highway Research Board meeting in St. Louis, Mo. Right now the responsibility of every truck owner and operator, private or public, is to conserve the rapidly diminishing stock of natural rubber that we have in existing tires. Thus tire service must be extended by reducing the amount of rubber expended. Savings can be effected which will carry us through this most critical period in the history of transportation until synthetic rubber can be developed and manufactured to replace the natural product.

Keep truck speeds between 25 and 35 mph; be very careful to keep the truck loads within the specified limits, don't overload; keep the tire pressures as specified and for long hauls regulate them according to the load; rotate the tires from wheel to wheel to distribute the wear; match tires as closely as possible, particularly dual tires; watch for bad wheel bearings which cause uneven tire wear. These are the most important factors to watch in the truck tire field.

Just what are we able to produce in this country which can be made into truck tires with the present tire manufacturing equipment? This is an emergency and we cannot afford the time or materials to make an entirely new type of equipment for the manufacturer of synthetic rubber tires. We must use what we have to save the cost in time and materials for a complete retooling of one of our greatest industries.

Buna S is the most likely of the synthetic rubbers yet developed and it is as good as natural rubber for passenger-car tires driven at war speeds. In truck tires it develops somewhat more heat than natural rubber, so cannot be used for as high speeds or as heavy loads. In tread compounds, Buna S chips or cuts somewhat more easily on rock, so that it is less suitable for construction or other equipment which must operate mostly on such terrain. Producers are improving this synthetic product all the time, and it is confidently expected that eventually it will be better, even for tires, than the natural product.

Reclaimed rubber is only 30 to 40 per cent as good as natural crude rubber for tire treads. Neoprene, because of its excellent resistance to oil and ageing, has had a long and successful utilization in various products. As a material for tires, it affords satisfactory abrasion resistance, but treads of Neoprene are liable to chip and crack at low temperatures. Butyl is 50 to 60 per cent as good as natural rubber, and makes fairly satisfactory tires, retaining its qualities at low temperature; there is difficulty in making it adhere to natural rubber, so that its use for recaps might not be feasible. Flexon has about the same properties for tire service as Butyl. Thiokol rates about 20 to 30 per cent for this service when compared to natural rubber.

These comparative ratings are not the sole product of one manufacturer, but are the conservative ratings of the entire industry based on extensive tests of all the synthetic rubbers and rubber-like materials available in this country.

President of Huber Dies

Edward J. Schroeter, President and General Manager, Huber Mfg. Co., Marion, Ohio, died suddenly on January 1 of coronary thrombosis. Mr. Schroeter succeeded his father as President of Huber in 1940. His grandfather was one of the founders of the Huber company which today is devoting its entire road and farm equipment facilities to the war effort.

A Camp Access Road In Central Missouri

Two Concrete Paving Jobs Poured Without Steel for Fort Leonard Wood by Perry McGlone Co.

(*Photo on page 56*)

✦ RUSHING to completion an access road to Fort Leonard Wood in Missouri, the Gillioz Co. of Monett, Mo., rough-graded the area for the two 22-foot divided roadways along the main highway and for the Y-link connecting to the reservation highway. The concrete paving is 22 feet wide with an 8½-inch unreinforced uniform concrete slab laid by the Perry McGlone Co. of Kansas City, Mo. It is necessary only to mention that Frank Creason of Liberty, Mo., was Superintendent for Perry McGlone to have many of our readers realize that there was something new in the way of mechanical devices on the job.

The Creason-devised Creason-built equipment on this paving job included: a subgrade planer, a checking planer, a device for setting the premoulded material in contraction joints, a power device for raising and lowering the boom on the paver, the Lakewood form tamper invented by Creason, and a power-operated longitudinal float built 5 years ago by Creason. The work on which these devices were used comprised Project SN-FA-176B(2), 0.669 mile in length, and Project DA-NR-1A(1), 0.184 mile long. This article deals with the concrete paving only.

Preparing Fine Grade

Where the rough grade was high, the paving contractor used an RD7 with a LeTourneau scraper to take out the excess dirt ahead of the trimming operation. The latter was done by a Caterpillar No. 77 power-control grader pulled over the roadway sections ahead of the setting of the forms for the pavement slab 22 feet wide and 8½ inches uniform thickness, with no steel. The form trench was cut by a Ted Carr Formgrader, followed by a pair of form setters with two helpers. The Heltzel forms had a 2½-inch top to insure the best riding quality for the equipment and consequently eventually for the slab itself. A crew of 21 men was used for the preparation of the fine grade under William Chaney as Grade Foreman. A subgrade planer "made by Creason" was pulled over the forms by a RD7 tractor to cut the grade as accurately as possible to the final line. This was rolled by a 5-ton Austin Pup roller and then a second checking planer was pulled over by the roller. The subgrade was left slightly low throughout the entire job to insure the best possible results in the thickness of the concrete slab. A Lakewood form tamper was used to give a firm foundation for the finishing equipment by packing the earth beneath the base of the forms.

Batching

All aggregates for these two short jobs were trucked in and stockpiled on either side of the Johnson weighing batcher plant where they could be rehandled easily by a Northwest crane with its 55-foot boom and 1½-yard Owen clamshell bucket. Because the aggregate batching plant was so close to the job and the job itself so short, there were only four 2-batch trucks used for hauling the batches.

Difficulties in securing the delivery of bulk cement by truck led to the use of bag cement which was delivered as bulk cement by Johnson KoneKarts to the batches after the aggregates had been placed in the truck bodies. The cement was covered with a canvas before the truck pulled away to the paver.

The dry weights for the batches used at the job were:

Sand	1,339 pounds
Crushed stone	2,327 pounds
Cement	550 pounds

28.6 gallons of water was added to each batch, corrected for moisture.

Pouring the Slab

This job was devoid of expansion joints except where the Y-branches met the main pavement. Water for the job was delivered from a point 3 miles distant to a stock tank and then boosted out to the paver by a C.H. & E. triplex road pump. The Koehring 27-E paver was run outside the forms to keep the subgrade in the best possible condition for the uniform thickness slab. No center steel was used on this job although the center plane of weakness was cut as required by the specifications and the premoulded joint material inserted.

There have been so many changes in the established procedures of paving since the restrictions in critical materials that we shall have the opportunity to study these factors after the war and see if in our enthusiasm for reinforcing, in pre-war days, we may not have gone too far. Then again the load-transfer discussion will come up for a thorough

(*Concluded on page 34*)

C. & E. M. Photo

Frank Creason—Himself.

Pan American Highway A Highway to Victory

Utilization of Present Highway System and Speedy Completion of Remaining Links Could Aid War Effort

By EDWIN W. JAMES, Chief, Inter-American Regional Office, U. S. Public Roads Administration

✦ MILITARY leaders of the United Nations have continually stressed the fact that the present world conflict is basically a "war of transportation". Every medium of transportation is included in this battle line, and these lines are the very fibre of world military strategy. In the vast interplay of men and military machines on the global battlefronts, the Pan American Highway system is destined to play a vital wartime role.

The construction of the Pan American Highway, like the Panama Canal, may be classed as a milepost in mankind's constructive achievements. The joint effort to build this great system of highways and principal connections of some 15,000 miles is a monument to the cooperative spirit of the Western Hemisphere republics, in sharp contrast to the holocaust of destruction now consuming the social and economic fabric of the Eastern Hemisphere.

The universal shortage of ship transportation has increased the importance of the Pan American Highway as a potentially vital factor not only in the battle of supply lines but also in the battle for raw materials so essential to our increased war production. South America is a storehouse of strategic materials for the great munition industries of the Arsenal of Democracy, and is now more important than ever before as a source of strategic materials formerly obtained from the Far East. Recently, Under Secretary of War Robert Patterson emphasized that raw materials are now the key to war production, and the War Production Board's Labor Advisory Committee made a strong statement in similar vein.

Highway Transportation Vital

The Pan American highway system has been under construction for almost nineteen years. When it is completed, nearly half a billion dollars will have been expended on it. Construction and improvements of this highway system are continuing today throughout the Americas.

For the internal movement of materials in South America, there already exist various railroad, air and river shipping facilities. Others have been proposed or are under construction which can be coordinated with the Pan American Highway. The course of the highway has been strategically laid out so that there are now convenient connections with other forms of transportation.

Right now the question is: can the Pan American Highway provide a major contribution to the war effort in the immediate future? Or must we wait until every mile of highway is paved from the U. S.-Mexican border south to Chile and Argentina? Can the Pan American Highway be utilized to bring strategic materials from other American republics to the United States? Can the Pan American Highway lessen the pressure on and destruction of shipping? The answer is an unquestionable affirmative, under certain concomitant conditions.

The use of highway transportation has figured very prominently in this world crisis. Our Government has recognized the importance of highway transportation for the movement of men and materials by granting large loans and appropriations to the other American republics, totaling between 85 and 95 millions of dollars, for the building of the Pan American Highway through Central and South America. But even these loans and appropriations may be inadequate if we want speedier completion.

Present Transportation

Ships are still the principal means of moving commodities in inter-American trade. Since Pearl Harbor, published reports indicate sinkings of more than 500 ships and the damaging of many others in Western Hemisphere waters. Nothing approaching such dislocation in the nation's sea traffic has been experienced since the War of 1812. The crux of the inter-American transportation problem is the long sea distance which makes this menace to our shipping so crucial. If transportation between the Americas over the long sea routes can be sharply reduced and if at the same time a continuous flow of essential supplies can be maintained, we are on the way to a solution of the problem.

Combined Land and Water Routes

Since it is the long sea lanes which expose shipping to attack during wartime, the transportation problem now resolves itself into a reduction of long-distance sea transportation by utilizing water and land routes. One need only

(*Continued on page 22*)

Laying Rock Asphalt On New Texas Route

(*Continued from page* 1)

time prior to the availability of funds for paving, which allowed considerable wind and water erosion to take its toll of the base. Consequently, the contract included the reconditioning of a large section of the old base with bid items for additional base material and binder, sprinkling, blading and rolling, as well as the prime and tack coats for the 1-inch rock-asphalt top.

When it came time to start this work, it was put through with remarkable speed, in spite of the asphalt freeze which hit the proceedings right in the middle. In fact, this was No. 1 job to be released for construction after the freeze order was issued in Texas. On Tuesday the contractor looked over the work with representatives of the State Highway Department, on Wednesday he submitted his bid, on Thursday he received his contract, and then came the freeze order on all asphalt, but the release for this job was received on Monday and the contractor started work on Wednesday. Things of an emergency nature connected with the war effort do not stay "frozen" long in Texas.

Prime and Tack Coats

When the reconditioning of the base was completed, the contractor was ready for the actual asphalt work. The prime coat of 0.25 gallon of MC-1 per square yard was applied by the contractor's own 1,050-gallon Littleford distributor, shooting 24 feet 6 inches wide in two trips over the road. This was allowed to cure for 4 or 5 days without traffic and then the work was ready for the tack coat.

The tack coat of RC-2 was applied the same width by the same equipment at the rate of 0.1 gallon per square yard. No time was allowed after the application of the tack coat before the spreading of the rock asphalt was started, and only sufficient tack coat was put down to care for a full day's work with the rock asphalt.

Laying the Rock Asphalt

The rock asphalt was received by rail and delivered on a siding about 1.2 miles dead haul from the job. At the siding the material was unloaded by a Quickway crane and a ½-yard Owen clamshell bucket to a fleet of seven hauling trucks. This rock asphalt runs from 7 to 9 per cent natural asphalt in the limestone aggregate and is cut with a fluxing oil at the rate of 2.85 per cent by weight. This amounts to about 7 or 8 gallons per ton of the rock asphalt. The aggregate is crushed in production to furnish a material with a maximum ⅝-inch screen size.

On the roadway the trucks dumped their loads in a windrow at the quarter point of the road, with the tail-gates down so as to distribute the rock asphalt somewhat in the proportion needed for the surfacing. The windrow was then bladed out by a Caterpillar No. 11 power grader to 110 pounds per square yard as specified and 24 feet wide. The initial rolling was by an old 3-wheel 4½-ton Fordson roller "in which there are now very few Fordson parts", according to the Superintendent, and then the finish-rolling was done, as mentioned before, by a 12-ton Austin Autocrat 3-wheel roller.

The material as spread and rolled was laid down to a string line. Any material that went over the line was hand-trimmed and thrown back onto the surface to be re-rolled. Sections of 1,000 to 1,400 feet are preferred by the contractor for working, as the length minimizes the number of joints and it gives two good sections to work each day, as the production is about 2,500 feet a day, using 350 tons for the 24-foot roadway.

On widening strips at intersections, the material was hand-shoveled from the trucks as the width was not sufficient to permit tail-gate dumping. On these sections the material was spread at the rate of 75 pounds per square yard, using three shovelers, two rakers, one lute man and a hand tamper to make the joint between the roadway asphalt and the widening strip. Large lumps that showed up in this work were picked out by hand and thrown out.

Quantities

The major quantities involved in the base-reconditioning contract and rock-asphalt surfacing included:

Additional base material	400	cubic yards
Additional binder	1,400	cubic yards
Sprinkling	1,949	1000-gallons
Blading	731	hours
Rolling	609	hours
Prime coat, MC-1	38,625	gallons
Tack coat, RC-2	14,047	gallons
Cold-mix blended rock-asphalt pavement	7,726	tons

Personnel

The contract for the reconditioning of the base and the laying of the rock-asphalt surface was awarded to Colglazier & Hoff, Inc., of San Antonio, Texas, on its bid of $66,785.89. L. A. Ferguson was Superintendent for the contractor and the work was done under the direction of Frank S. Maddox, District Engineer, Texas Highway Department, with B. K. Garrett as Resident Engineer and E. L. Sublett, Inspector.

Compact Air Compressors

A new folder, A-442, has just been issued by Schramm, Inc., West Chester, Pa., on Schramm Fordair compressors. It illustrates the various services of this compact unit which consists of a Ford Mercury cylinder block, plus the Schramm patented mechanical intake valves, heads and intake manifold without chains, gears or belts. Schramm Fordairs are available as crawler units, on self-propelled rail cars, for 2-wheel mountings, with or without tool boxes, skid-mounted and in various other mountings illustrated in this folder.

Copies of the folder will be sent to you by Schramm promptly upon request if you mention this review.

The Division Garage And Shops at Topeka

Division 1 Headquarters In Residential Section An Attractive Structure Built for Utility

(*Photos on page 56*)

✦ LOCATED in the heart of the residential section in southern Topeka and surrounded by well-kept lawns and attractive landscaping totalling about 6 acres is the cut-stone building which is headquarters of Division 1 of the State Highway Commission of Kansas. The front section, two stories high, contains the offices, while the rear portion has two entrances at different levels from two streets, the upper to the shops which are at the same elevation as the first floor offices, and the lower entrance to the heavy equipment repair shops at basement level.

The Offices

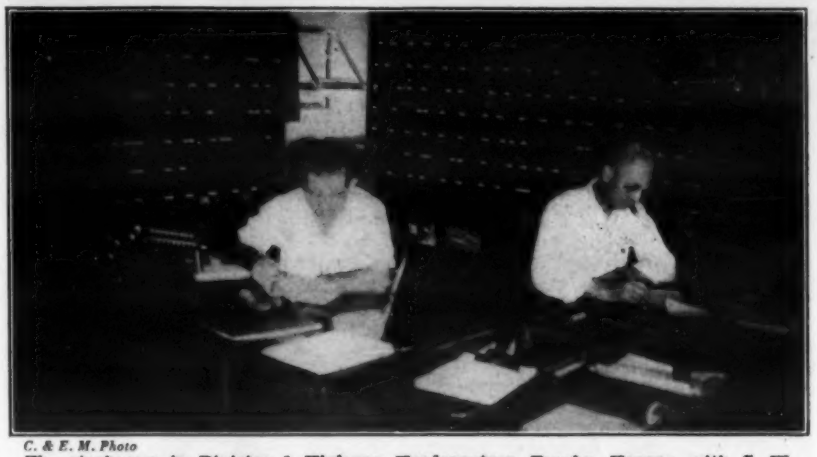
The front of the building faces north, with the main entrance flanked on the left by the telephone switchboard, presided over by the Division Engineer's secretary who also serves as telephone operator and receptionist. On the right of the entrance door is the office of the accounting clerks for the Division. The office at the northeast corner is for the Division Engineer, with the Assistant Division Engineer for field work in the office immediately behind. In the northwest corner is the office of the other Assistant Division Engineer who handles office responsibilities. In his office is the radio receiver and the inter-communicating unit which operates over a direct telephone wire to the master station in the Maintenance Engineer's office at Highway Department Headquarters about ten blocks away. In addition, through this inter-communicating system, direct connection can be made with the Highway Patrol headquarters or with the radio transmitter located in the NYA School which has constructed the entire system as will be described in a subsequent article. By throwing a switch, the office engineer can talk out over the air to any of the cars equipped for reception, and those with two-way radios can reply.

Immediately back of the Office Engineer's radio room is the office of the Chief Clerk who is the head accountant for the Division. Beyond this office are the stairs going to the upper floor originally intended for a drafting room with adequate north light, and with two additional offices, a storage room and a toilet. Opposite the stairs are a form file closet and the freight elevator from the ground floor to the basement, through which access is secured from the stockroom to the shops. The central portion of the office section is taken up with a large and well-laid-out stockroom. The general correspondence file room and two toilets make up the balance of the facilities on this floor.

The Repair Shop

The upper level at the back, at the same elevation as the offices, is the large and well-equipped repair shop of the Division. A clockwise trip around the shop, starting at the northwest corner, shows the types of facilities provided for the care of light equipment. The electric shop is set off from the remainder of the repair shop by a heavy wire enclosure. It is equipped for the repair of generators, starters, magnetos and carburetors, and contains a General Electric Tungar battery charger, an Allen generator and magneto testing stand with a small Allen lathe mounted on the same stand, an Eisemann

(*Continued on page 38*)



C. & E. M. Photo

The stockroom in Division 1 Highway Headquarters, Topeka, Kansas, with C. W. Little, Stock Clerk, at right, and Norman Cowperthwaite, Assistant.

AWARD of MERIT

CONSTRUCTION BATTALIONS, U. S. NAVY

THIS CERTIFICATE IS AWARDED TO O. E. Potter
IN ACKNOWLEDGMENT OF HIS PATRIOTIC CONTRIBUTION TO THE WAR EFFORT IN OBTAINING THE ENLISTMENT OF RECRUITS FOR SERVICE IN THE CONSTRUCTION BATTALIONS OF THE UNITED STATES NAVY

Ben Moreell
BEN MOREELL
Rear Admiral, Civil Engineer Corps, U. S. Navy
Chief of the Bureau of Yards and Docks
Navy Department, Washington, D. C.

ISSUED December 1, 1942

Two U. S. Navy Awards of Merit in the first group were received by CONTRACTORS AND ENGINEERS MONTHLY, one to O. E. Potter, Managing Editor, for the editorial and pictorial material on the Seabees, the Construction Battalions of the Navy, which aided "in obtaining the enlistment of recruits for service" in the Seabees, and the second to Donald V. Buttenheim, General Manager, for his cooperation in making this construction magazine available to construction and purchasing officers of the Navy.

An Employment Drop Expected During 1943

Employment on new construction in 1943 will drop to an average of little more than a million workers, or about one-half of the average for 1942, according to a report of the U. S. Department of Labor. This means that during the year, a million workers from the construction industry will become available for other war employment such as shipbuilding which will require a considerable number of new workers but will not absorb the entire slack from construction labor. Employment on privately financed construction is expected to drop to an average monthly level of only 290,000 or approximately 40 per cent of the 1942 average. Labor requirements for publicly financed construction will decline to a monthly average of 750,000 or 60 per cent of the labor on such projects during 1942.

The war construction program reached its peak during August, 1942, when 1,675,000 workers were required for all public construction activity. By June, 1943, only 810,000 construction workers will be employed on publicly financed projects and a further drop during the latter half of 1943 is expected to place employment on these projects at less than 400,000 workers.

Necessary conservation of critical materials resulted in drastic curtailments in private construction during 1942. Employment on private work declined from 966,000 in January to 452,000 persons in December, 1942. Further decreases are forecast for 1943, and by December, 1943, only 180,000 persons will be working on privately financed construction. The figures presented cover wage earners, salaried workers and special trade contractors actively engaged in construction.

A New Waterproofing Used On Bridge Deck

A new method of waterproofing a bridge deck was used by the C B & Q Railroad recently instead of the customary asphalt planking which has been used for many years as a protection course over membrane waterproofing on railroad viaducts and bridges. The ballast is super-imposed on the protection course, thereby protecting the membrane waterproofing from fracture.

Asphalt planking is furnished only in widths up to 12 inches. However, Keystone asphalt mastic board, made by Keystone Asphalt Products Co., 43 E. Ohio St., Chicago, Ill., is available in widths up to 48 inches, and consequently cuts down the number of open joints by about 5 to 1. In the case of the C B & Q job, standard 85-pound Keystone asphalt mastic board was used, with three sheets laminated by means of ordinary mopping asphalt.

Further information regarding the uses of asphalt mastic board may be secured direct from the manufacturer by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

The new Graco Convoy Luber for field lubrication.

A Small Field Unit For Power Greasing

A new Graco Convoy Luber has been designed especially for the smaller contractor who does not need a large portable field lubrication unit, but who still requires power lubrication of his construction equipment. The Gray Co., Inc., 60 Eleventh Ave., N. E., Minneapolis, Minn., has announced the LU-150 Graco Convoy Luber which dispenses lubricant directly from the original 100-pound drums. It is powered by a 4½-hp air-cooled gas engine driving a 12-cubic foot air compressor supplying air at 175 pounds pressure to a 35-gallon storage tank. Three lubricant pumps dispense gear lube, track or hypoid lube, and chassis lube.

The easy loading feature of this new model has a distinct appeal to contractors. Four large hose reels with locking brakes provide three 30-foot high-pressure lubricant hose which make the largest of equipment accessible to the Convoy Luber. A 50-foot air line on the fourth reel quickly services large pneumatic tires of all kinds. The lubrication of all types of construction machinery is a difficult job at best and especially so when done under extremely adverse field conditions. Graco Convoy Lubers are designed to aid in speeding up lubrication, saving man-power, and at the same time insuring a complete job on the large bearings on tractors, shovels and scrapers.

The Gray Co. will send complete information on this new low-priced Convoy Luber upon request. Ask for Catalog No. 122R and mention this item.

New Honduran Bridges

One new bridge spanning the Goascoran River to connect El Salvador and Honduras, and two other bridges over the Guacirope and Grande Rivers, also on the Inter-American Highway, are to be completed in the spring of 1943. The new international bridge connecting El Salvador and Honduras will make possible transfers of merchandise by truck which will come in via Mexico over the International Railways of Central America in El Salvador and thence to Tegucigalpa, Honduras.

The three bridges will be of simple steel truss construction, one with a continuous truss of three spans. The bridges vary from 250 to 400 feet in length. Surveys and borings are already completed at the bridge sites and the contract for the substructures has been awarded to Frederic Snare Corp., New York City, while U. S. Steel Export Co. is fabricating the superstructures.

Stresses In Corners Of Concrete Pavement

Stresses in the corner regions of concrete pavement slabs may now be calculated by means of a relatively simple formula, which is believed adequate for design use. This formula has been developed by M. G. Spangler, Research Associate Professor of Civil Engineering, Iowa State College, after observations of the strains in the top surface of a number of experimental concrete pavement slabs constructed in the laboratory.

The results are presented in Bulletin 157 of the Iowa Engineering Experiment Station, "Stresses in the Corner Region of Concrete Pavements". The bulletin presents a brief discussion of other research studies on concrete pavement stresses, including the Bates road tests, the Westergaard analyses, and the Arlington tests by the Public Roads Administration.

Single copies of this 96-page bulletin may be obtained without charge from the Iowa Engineering Experiment Station, Iowa State College, Ames, Iowa.

Wage and Hour Laws In Contracting Field

The Applications and the Exemptions of Fair Labor Standards Act in Field Of Construction

By WILLIAM B. SMITH, Acting Chief, Magazine Service Section, Information and Compliance Branch, Wage and Hour and Public Contracts Divisions, U. S. Department of Labor

✦ THE Fair Labor Standards Act had a birthday recently. On October 24, 1942, this Federal Wage and Hour Law was fours years old. Nowadays there are few employers or employees who are not familiar with the basic provisions of the Act, which applies to all employees engaged in interstate commerce or in the production of goods for interstate commerce. Unless specifically exempted by the Act, such employees must be paid not less than 30 cents an hour and not less than one and a half times their regular rate of pay for all hours worked beyond 40 a week.

Most employers in the engineering and construction fields know in a general way that some types of construction work are not subject to the Act, but when it comes right down to cases, a good many firms are not sure whether their operations come within the scope of the Act and whether or not certain employees are covered by the minimum wage and overtime provisions.

In its enforcement procedure, the Wage and Hour Division has consistently taken the position that employees engaged in *original* construction are not covered by the Act merely by virtue of that employment, even though the structures will later be used for interstate commerce or the production of goods for interstate commerce.

"Original Construction"

Before giving a fuller definition of the term "original construction", it should be noted that there may be particular employees of construction firms who engage in the interstate transportation of materials or other forms of interstate commerce that would be entitled to minimum wages and overtime in accordance with the Act. However, the mere fact that a contractor performs construction work in several states would not change the status of his construction employees, unless such employees would otherwise be covered by the Act.

For instance, if a construction firm maintained its principal office in Chicago, say, and undertook construction jobs in the neighboring states of Indiana and Wisconsin, employees engaged solely in original construction work in the latter states would not be subject to the Act. Employees moving materials, machinery, or other goods across state lines would be covered. And employees in the home office of such a concern—draftsmen, engineers, bookkeepers, stenographers, receptionists, telephone operators, and the like—also would be covered.

The Wage and Hour Division holds that original construction means the erection or construction of *new* structures or facilities.

Interpretative Bulletin No. 5, and a special release, G-162, both issued by the Wage and Hour Division of the U. S. Department of Labor, discuss the status of construction work which involves essential instrumentalities of interstate commerce, such as railroads, highways, bridges, pipe lines, air fields and runways. Interpretative Bulletin No. 5 left open the question of the applicability of the Wage and Hour Law to employees engaged in the *original* construction of such works. And, as G-162 states, that is still the Division's position.

In other words, the Division is not prepared at the present time to give a definite opinion on the question of coverage where employees are engaged solely in the original construction of such essential instrumentalities of interstate commerce.*

The Division does believe, however, and both Interpretative Bulletin No. 5 and G-162 have so stated, that the *maintenance*, *repair* and *reconstruction* of essential instrumentalities of interstate commerce are within the general coverage of the Fair Labor Standards Act. Such work on the following items, therefore, would be covered: railroad tracks, equipment and facilities; highways; city streets over which interstate commerce regularly travels; rivers, streams, harbors and other waterways used more or less regularly in the interstate transportation of goods; bridges over which interstate commerce more or less regularly travels; pipe lines used for the in-

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*This statement in no way limits the right of employees to sue for legally earned but unpaid minimum wage and overtime compensation due them under the Fair Labor Standards Act. If successful in such suits, the courts must award employees an equal amount as liquidated damages and assess court costs and a reasonable sum for attorney fees against the defendant.

Colorado State Highway Dept. Photo

Loading pre-mix with a power-operated scoop, Division 6, Colorado State Highway Department, Craig, Colo. Only the truck driver and helper are required to operate the scoop; the man standing in the truck is audience.

Loading Oil Pre-Mix With a Power Scoop

A simple effective time-saver for loading oil pre-mix from stockpiles into maintenance patrol trucks was rigged up by Lloyd Gregg, Mechanic in Maintenance Division No. 6 of the Colorado State Highway Department, Craig, Colo. The device, built in the Division Shop, consists of a winch, the drum of which was made of a piece of 10 x 18-inch pipe with an old disk welded on each end for flanges. The gears were assembled from an old tractor which had been junked.

This winch is mounted on a gantry frame made of angle iron, placed back of the cab of a four-wheel-drive truck, and bolted down to the truck frame. The power is taken off the drive shaft between the main transmission and the compound transmission. The chute consists of a piece of sheet metal 16 feet long, 3 feet wide and 3/16 inch thick, reinforced along the edges with angle iron to strengthen it and also to guide the scoop and keep it from sliding over the edges. A pair of channel irons fastened to the chute at one end act as legs to hold it upright when the truck is loaded and driven away. Thus it is ready to be hooked on the tail-gate when the truck returns for another load. The helper pulls the scoop down the chute, unreeling the cable until he is in position to load the scoop. Then the truck driver throws in the clutch on the winch which pulls the scoop up the chute or ramp into the truck body.

With this rig, the two men easily load 4 yards of pre-mix into the truck body in 10 minutes, including the time for hitching up the scoop and hooking on the chute. It can be used for loading the truck on which it is mounted or for loading other trucks.

Support the American Red Cross.

Indiana Traffic Drop In November Counts

Traffic volume on the state highway system of Indiana, as registered by twenty automatic counters maintained by the State Highway Commission, dropped 24.2 per cent during November, 1942, as compared with the same month in 1941. This reduction in traffic volume has been shown by the automatic counters for the past several months when voluntary action by motorists was taken to conserve tires and lower operating speeds.

A further reduction from 1941 traffic flow will be shown by the December report which will cover the first three weeks of gasoline rationing in Indiana. In eastern states where gasoline rationing has been effective since May, 1942, traffic volume has decreased approximately 45 per cent under the preceding year.

The counters in Indiana do not reflect a complete picture of traffic movement, except as applied to the particular section of state highway on which they are located, since there has been a considerable increase in traffic flow on other routes which serve war plant areas.

Alex. Botts Rides Again

Construction men have found much relaxation in the past reading the remarkable adventures of Alexander Botts, the super-salesman of Earthworm tractors. Botts is at it again in "Keep 'em Crawling", a new book by William Hazlett Upson. This book includes stories never before published in book form and makes very interesting reading for construction men.

The author, well known to the construction field, talks the language of the job as he tells how Botts goes from one job to the next with complete assurance, getting out of every predicament in a manner which brings a smile to the face of equipment users.

"Keep 'em Crawling" is published by Farrar & Rinehart, Inc., New York, N. Y., and is priced at $2.00.

Award-Winning Job In Southwest Ohio

Ingenuity in Handling of Roadside Items and Use of Machines Feature Work of Middle West Roads Co.

(*Photos on page 4*)

✦ THE job for which the Middle West Roads Co. of Indianapolis, Ind., received CONTRACTORS AND ENGINEERS MONTHLY's 1941-1942 National Roadside Development Award was 3.11 miles in length, running east and west on U. S. 50 in Hamilton County, Ohio, along the base of long sloping hills on the north side of the route with a valley below the level of the roadway on the south side. This project, FAP 582-F-2 and 582-G(1), awarded to the contractor on its low bid of $449,729.62, consisted of grading, widening and paving, with some roadside-development items. The widening for the 41-foot pavement and the two sidewalks required grading numerous fills and cut slopes varying in height from 10 to 90 feet. Work was started on February 12, 1940, and completed on October 31, 1941.

The use of long vertical and horizontal curves blends the high-speed highway, which is 10 to 30 feet above the valley floor, into the natural topography. The large cuts and fills were due to a railroad right-of-way adjacent to certain sections of the project. Considerable clearing of undergrowth was necessary on the south side of the highway to permit views of the picturesque valley. All cuts and fills were graded to within 3 inches of the finished grade and then compacted. Immediately following this, a 3-inch layer of topsoil was spread to bring it to finished grade.

Examples of Cooperation

One of the major contributions of the contractor to the successful completion of this project was the manner in which the topsoil was handled. The topsoil borrow pits were first carefully stripped before the soil was removed. In securing topsoil for several slopes located on fine residential property, the contractor, of his own volition, ran several hundred yards of soil through a home-made screen in order to furnish a better-quality seed bed than that required by the Department of Highways. In addition, the stones which were screened from the topsoil were graded into two sizes and used as a thick layer of aggregate over the roots of a number of trees which have an unforeseen fill around them. Thus, in using this screen, the contractor not only furnished a much finer seed bed through the residential section but he also preserved a number of fine trees by providing for root aeration. The contractor received no reimbursement for these two extra operations.

In another instance the contractor removed several yards of flat field stone from the large cuts and placed them in little gulleys for erosion control. These were located just in back of the concrete intercepting ditches along the tops of all cut slopes on the project. This action not only helped the contractor to stop soil eroding into the intercepting ditches but also saved the state maintenance forces the job of carrying the stone from the toe of the slope later.

In several cases, where changes were made in the grade around the root areas of trees which had been marked on the plans for protection, the contractor furnished additional labor and material properly to adjust the riprap and aggregate to the new grade. As these changes were necessitated by changes in private lawn grading, such extra effort on the part of the contractor was very gratifying to the owner of the property and thus created good will between the state and the adjacent property owners.

In many cases, the contractor trimmed large limbs on trees in order to give additional sight distance and clearance. Although not required by the specifications, this work was done according to proper tree-trimming practices and resulted in a fine appearance. One large tree in particular was scheduled for re-

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A view of the concrete intercepting ditch on the Middle West Roads Co. project, and also completed seeding and mulching on the slopes.

All operators signing the Thew pledge to prolong the life of construction equipment get a sticker like this in red, white, and blue.

Long Life to Equipment, Sign the Service Pledge

Contractors and operators are asked to sign a pledge that they will do all in their power to prolong the life of any construction equipment in their ownership or care, regardless of the type or make. The Thew Shovel Co., Lorain, Ohio, has inserted pledge cards in its advertisements, and everyone signing the pledge to prolong the life of their equipment will receive a red, white and blue emblem, like the illustration, which can be displayed prominently on the equipment.

Thew is also sending a book of instructions entitled "The Thew-Lorain Emergency Fix-It Handbook," which shows users how to make repairs without having to wait for new replacement parts. Send for your pledge card today and display the red, white and blue construction equipment conservation sticker on the cab of your shovel, crane or grader.

More Civilian Engineers Needed By Government

The education and experience requirements for engineers for the Government have been lowered to meet the increasing need for filling engineer positions, according to the U. S. Civil Service Commission. For the grades of Assistant Engineer, $2,600 a year, through Chief Engineer, $8,000 a year, applicants must either have successfully completed a full 4-year course leading to a bachelor's degree in engineering in a college or university of recognized standing, or must show professional engineering experience providing the substantial equivalent of such a course, in addition to the required experience.

One year of professional engineering experience, or of engineering graduate study, is required for Assistant Engineer, $2,600 a year. For higher positions applicants must show additional experience of a progressively higher level. Graduate study will be accepted on the same basis as experience, except that, in general, graduate study alone will not be considered qualifying for grades above $3,200.

Applications will be accepted until further notice, but qualified persons are urged to apply immediately. No written test will be given, and applicants will be rated on the basis of their statements in the applications, subject to verification by the Commission.

Applications and complete information may be obtained at first and second-class post offices, except in regional headquarters' cities where they are available only at the Civil Service Regional Offices, or from the U. S. Civil Service Commission, Washington, D.C. Persons doing war work are not encouraged to apply unless they may use higher skills in the positions sought.

Distributor Service Meets Customer Need

Another example of what equipment distributors are doing to aid their customers in meeting the demands of production under war restrictions comes to us from Wm. H. Ziegler Co., Inc., of Minneapolis, Minn. One of Ziegler's customers needed a second diesel engine to increase its production. Ziegler was able to obtain a used Caterpillar diesel engine but didn't fare so well when it came to the clutch and shaft assembly, because of the war demand and priorities. The customer got the unit just the same and it was tailor-made for their needs by Dick Anderson, shop foreman of the Crookston, Minn., branch of the Ziegler organization. Out of odd parts and other materials he did the job, turning out a new shaft for the drive assembly on his lathe and practically manufacturing the entire clutch and shaft assembly.

While Ziegler Co. does not claim to have all the mechanics and mechanical engineers, they do believe that they have some of the best, and offer this as an example. Many other distributors are doing similar service jobs for their customers as one of their contributions to the nationwide war effort.

Guarding the Roads Of Maricopa County

Efficient Shops and Good Mixed Asphalt Top Extend Life of Equipment and Roads of Arizona County

✦ WITH 3,604 miles of roads within an area of 8,891 square miles, the Highway Department of Maricopa County, Arizona, has a very real problem. Forty per cent of the population of Arizona is in Maricopa County and half the area of the county is uninhabited. The paved roads are naturally centered about Phoenix, which is both the state capital and the county seat. Every endeavor is being made to extend the paved system. In 1941, 25 miles of mixed bituminous surfacing were placed, but a considerably smaller mileage in 1942. The 1941 paving was done as straight county work with no aid from WPA or other Federal agencies.

MARICOPA COUNTY ROAD MILEAGE

Earth	2,000 miles
Graded and drained	463 miles
Soil surface	57 miles
Gravel and stone surface	433 miles
Mixed bituminous surface	392 miles
Bituminous-concrete surface	22 miles
Concrete	231 miles
Dual type, asphalt outside and concrete center	6 miles
Total	3,604 miles

Mixed Bituminous Paving

The county is very fortunate in having an abundance of good quality gravel which it uses in all its road work. The pit-run gravel of the Salt River is a hard stone that crushes well. Pits are available in the river at intervals of 3 or 4 miles, but with considerable oversize of 4 inches and larger. A Cedarapids 9 x 36 roll crusher with Symons vibrating screens is used for crushing and screening the river gravel. A Bay City ½-yard shovel loads the river gravel into two 4-yard Dodge shuttle trucks while a fleet of some fourteen trucks is usually needed to haul away the crushed material on an average haul of 12 miles. The fleet at the time of our visit consisted of nine 5-yard and five 3½-yard trucks. These trucks were hauling base in preparation for the mixed bituminous top.

The gravel base for the mixed top is usually built up 32 feet wide and 4 inches thick of maximum 1-inch screened crushed gravel, and rolled by an 8-ton Galion roller. To provide for drainage, a crown of ¾ to 1 inch is placed in the base in preparation for a similar crown in the top. The base course requires approximately 2,200 yards per mile for the full depth. Sometimes, when the original road was well built up, not as much gravel is required in order to bring the base up to sufficient strength.

The first operation in the surface course for the mixed bituminous top is the spreading of about 1,100 cubic yards of graded crushed gravel with a maximum 1-inch screen size. This is windrowed to one side and then about one-third of the windrow bladed out to 10 feet wide and shot with SC-4 in summer, or SC-2 in winter, at the rate of 1 gallon per linear foot of road 20 feet wide on each blading out of the windrow. Thus the total bituminous material used is 3 gallons per foot of road or between 4.3 and 4.5 per cent by weight. The county buys the asphalt and applies it with its own 1,100-gallon Kinney pressure distributor. The spreading of the windrow in layers and the application of the asphalt are completed before any mixing is started.

About 1 mile of road is worked at a time as most convenient for the size of the distributor, and to reduce the number of joints in the completed job. When the third application of asphalt has been made, two of the county's battery of six Caterpillar No. 11 and one Adams power graders with 12-foot blades are used to put the "sandwich" up into a windrow. Then mixing starts, with the graders working together to keep the material as closely worked as possible and away from traffic. At the end of mixing, the windrow is spread to 20 feet and rolled as required.

One of the reasons for the success of the mixed mat surface used in Maricopa County is the care taken in the design and the grading of the aggregate to secure the maximum amount of aggregate in the road mix for stability without getting segregation under the blades. The material is run into two bins at the crushing plant, one holding ⅜-inch stone down to sand, and the other 1-inch down to ⅜-inch. These are hauled out onto the road in about equal amounts in the 5-yard trucks and each load makes 50 feet of surface. It is constant care such as this in the construction of the lower-cost roads that makes for their longer life and greater economy. No seal is used on this mat and some of the surfaces have been down for six years without the need of any maintenance except the few places where base failure, due to inadequate gravel base, has required some patching.

C. & E. M. Photo
Typical surface texture of a 4-year-old Maricopa County asphaltic "oil mat" without seal. Numbers on the scale indicate square inches.

This "oil mat", as the surface is called locally, cost about $5,000 a mile in 1941, including the 4-inch base course of crushed gravel. The average cost of the 16-foot concrete road constructed under a bond issue in 1920-1922 was $27,500 per mile and some of this has

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Pan American Route Can Aid War Effort

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glance at the map to note that the distance between Valparaiso, Chile, or Buenos Aires, Argentina, and North Atlantic ports such as New York is much greater than the distance from Buenaventura, Colombia, or La Guaira, Venezuela, to New Orleans, La. In view of restrictions on shipping, it may be well to reexamine our transportation channels. Alternatives may offer difficulties and barriers, but these are not insurmountable.

In weighing alternative combinations of land and water routes, it is the South American section of the Pan American Highway with which we are at present concerned. Except for about 2,000 miles of continuously surfaced roads in Mexico, the 3,500 miles of the Central American section of the highway is not under consideration, as that portion is still under construction. Some intermediate sections are completed, but will not be continuously connected until June, 1943. Approximately 300 miles of territory in southern Panama and northern Colombia are still only semi-explored.

The South American section of the Pan American Highway between La Guaira in Venezuela and Rio de Janeiro, Brazil, is about 8,200 miles long following for the most part the Pacific Coast through Colombia, Ecuador and Peru and continuing southeast through Bolivia and Argentina and thence northward along the Atlantic coast through Uruguay and Brazil. It is about 325 miles longer from the junction point at Vitor, Peru, by the western route which continues south through Chile and eastward to Argentina.

The Pan American Highway's completed and projected routes are shown on the accompanying map. Reports reaching the Public Roads Administration as of August, 1941, indicated that the highway in South America was 76.1 per cent finished for year-round driving. In addition, 20.3 per cent, which is "dry-weather" road, can be used six months during the year, bringing the total of useful highway to 96.4 per cent for at least six months in the year. Additional construction and improvements during the past year have probably moved this figure up to about 98 per cent.

The principal bottleneck in South America is a 290-mile stretch in Ecuador. For construction in this area the Export-Import Bank of Washington has made a loan of $900,000 to Ecuador. Only 75 miles of road can be constructed with this loan. However, with the immediate additional expenditure of approximately $7,500,000 for construction in this area it would be possible to make a detour road available in two months and to complete the 290-mile gap in about five months of actual construction. The construction time element depends on the amount of necessary road-building equipment made available and the provision of shipping space and other facilities to get road gangs and supplies to construction sites. It is not unreasonable to expect that building the highway in the Ecuador region, although in a mountainous territory, could be completed in record time if funds and equipment were made available.

Until the 290 miles of road in the Ecuador section is ready, the area between Talara, Peru, and San Juan, Ecuador, may be negotiated by a 10-hour water jump of about 175 miles from Talara to Guayaquil, Ecuador, or from Puerto Bolivar to Guayaquil, a distance of only 90 miles. From Guayaquil a 115-mile detour east to San Juan, situated on the Pan American Highway, can be used in the dry season. It would require only about two months to make this road ready for "all-weather" truck movements.

From April to November, in the 12,600-foot Uspallata Pass in the Andes Mountains, at the border of Chile and Argentina, winter snows accumulate and prevent normal movement of wheeled traffic between the two countries for about six months of the year. If increased traffic warrants it, snow plows could keep this road open the year round. An alternate central route north of Buenos Aires to La Paz, Bolivia,

(*Continued on next page*)

Use of Highways Can Shorten Ship Routes

(Continued from preceding page)

connecting with the western branch of the Pan American Highway to Vitor, Peru, could be utilized to serve Argentina, Uruguay, Paraguay, Bolivia and portions of southern Brazil during the winter months, so that there could be free movement of vehicles over the highway all during the year. Additional construction of alternate "all-weather" routes also is under consideration. With Brazil's active participation in the war against Germany and Italy, the movement of military supplies and strategic materials over safe dependable routes has become even more urgent.

Long-Distance Hauling

Truck transportation over the Pan American Highway is expected to be a principal feature of future trade among the other Americas. Trade among the American republics is more important than ever before now that they are cut off from many foreign markets. A plan to supplement shipping by utilizing trucking over the highway for transportation to the United States of vital strategic supplies would be an important step in providing materials for urgent war production as well as in maintaining South America's economy.

Recent reports from Peru indicate that plans are being considered to solve local transportation problems engendered by the shortage of shipping by using truck convoys over the Pan American Highway to haul goods from southern to northern Peru, over a distance of about 1,000 miles. These plans propose to accumulate cargoes in northern Peru and thus save a thousand miles of ship movements.

There are about 10,000 diesel-type motor vehicles in the Western Hemisphere, approximately half of which are in the other Americas. Over 150,000 gasoline trucks were reported to be frozen when the executive order banning sales of motor vehicles went into effect. Only about 50,000 of these are believed to have been released. Thus a large stockpile of various sizes of trucks is still on hand, making it possible to divert a large fleet of gasoline motor trucks for transportation of vital materials from South America. The use of diesel trucks would mean a major saving in motor fuel as well as in storage space and would eliminate to some extent dependency on gasoline facilities, although fuel is available in South America. South American nations too have a supply of trucks which could be used and the truck movement would be as vital to them as it could be to the United Nations.

The number of motor vehicles to be made available by this country would of course depend on the priority rating of supplies originating in South America. Everything must give way to the production and release of ships, planes and military weapons, but since the use of the highway would shorten very considerably the distance covered by United Nations shipping, it should be an easy decision to yield priorities on motor vehicles which would release ships for the transportation of planes and military equipment to the fighting fronts and at the same time obtain raw materials from South America to build more ships, planes and weapons. This entire process is indivisible for the successful prosecution of the war—one step impinges on another and all are equally important.

Facilities and Supplies

The question may be raised as to whether necessary supplies and service facilities exist in South America to provide for a large-scale long-haul trucking movement. There is oil in Venezuela, the second largest oil producer in the world, and in Colombia, Peru and Argentina. There are large quantities of asphalt in Venezuela, Peru and Ecuador, for use in the completion, improvement and repairs of the highway. Other native materials have also been used effectively in highway construction.

There is rubber in Brazil, Colombia, Bolivia, Ecuador, Peru and Venezuela. There are twelve tire factories in South

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Wyoming Road Work Summer and Winter

Maintenance Concentrated, Patrols Abandoned, Fewer Crews, Better Equipped To Do Work; Snow Removal

✦ THERE are about 4,075 miles of main highway in Wyoming to be kept in repair in summer and clear of snow in winter by the maintenance forces of the State Highway Department. Road maintenance headquarters for field work are established at seven points throughout the state: Cheyenne, Casper, Sheridan, Basin, Lander, Lusk, and Rock Springs, with additional storage garages for equipment at 27 other points. The permanent maintenance force has included about 150 men, until war industries, the call to arms, and depleted income from the state gas tax, of which 3 cents goes to the state highway department, reduced the force somewhat. These men served throughout the year, but the force was greatly augmented in summer by hourly labor hired locally. These extra men were laid off gradually during the autumn until the basic or skeleton maintenance crew remained for winter work.

From Patrol to Roving Crews

The old patrol system of a man every 20 miles along the highway has been abandoned for good in Wyoming. In place of that system, a super-patrol system has been developed with a unit of patrol having a center and working from 25 to 75 miles in all directions from that central point. Each of these patrol units has dump trucks, but the power graders for heavy maintenance grading are centralized at the larger maintenance headquarters and are sent out only as needed. Similarly the six small power shovels owned by the state are moved about on equipment trailers as required.

Patching of the oil-mat surfaces is done by the local patrol units but if a complete tear-up of a section of mat is necessary for any reason, then one of the power grader units from the larger headquarters maintenance stations is moved to that section temporarily. Seal coating is handled in the same manner.

Snow Removal

Snow removal is handled mostly by 1½-ton trucks equipped with one-way plows which go out as soon as a snow storm starts and keep going until the last vestige of snow is removed from the main highways. The worst snow belt in the state is along the west and south borders of the state. In these sections six small rotary plows are used and eight large V-plows on all-wheel-drive trucks of various makes. One Snogo 3-auger rotary plow is kept in reserve for hitting the bad places and breaking open such highways as have become blocked in spite of the activities of the other equipment. Along the ridges it is sometimes necessary to use dynamite to remove the heavy wet snow that has frozen and cannot be touched with any of the equipment.

Not all of the mountain passes are kept open in winter so that in the spring and early summer it is necessary to attack roads covered with 20 feet of snow.

1942 Truck Hauling Equals 1940 Volume

The volume of truck hauling on main rural highways in 1942 was substantially the same as in 1940, despite restrictions imposed last year on truck operation to conserve vehicles, tires and gasoline, according to the Public Roads Administration. During 1942, trucks hauled an estimated 46 billion ton-miles of freight on main rural roads, compared with 46.7 billion in the normal year 1940.

A large but undetermined amount of the 1942 volume was traffic of war industries and it was the urgent war need for highway transport which prevented any substantial reduction in total truck hauling last year despite motor vehicle restrictions.

Heavier loads were possible because of increased used of "combination" outfits. Equipped with 3 to 7 axles, dual wheels, and 10 to 26 tires to keep loads within legal limits, these tractor-truck, semi-trailer, and trailer combinations haul pay loads up to 25 tons or more and weigh up to 42 tons loaded. The traffic of truck combinations has been increasing since 1936.

Combination outfits are especially numerous in the West. This in part explains why ton-miles of load carried by trucks in the Pacific region were about 22 per cent greater in 1942 than in 1940, but in the country as a whole slightly less in 1942 than in 1940.

Axle loads in excess of 18,000 pounds, which tend to damage road surfaces and are illegal in 35 states, were nearly three times as numerous in 1942 as in the period 1936-40. This explains the increasing damage to pavements in war industry areas and makes more urgent the expenditure of funds for adequate maintenance, resurfacing, and in some places complete rebuilding of main rural and urban highways.

Chemical Companies Merge

The Michigan Alkali Co. and the J. B. Ford Co., both of Wyandotte, Mich., have combined to form the Wyandotte Chemicals Corp. Contracts and commitments of both companies in force at the end of 1942 will be executed by the Wyandotte Chemicals Corp.

Michigan Alkali is a basic chemical producer of calcium chloride.

Grouting and Concrete Placing at Idaho Dam

(*Continued from page 2*)

case of a shut-down on the incoming power line.

Portable equipment for compressed-air service included two Gardner-Denver 310-cfs compressors with Caterpillar diesel engines. On the job at various times during the heavy rock work were six wagon drills of various makes. Their efforts were generally directed at the spillway excavation and the cut-off trench operation.

Cut-Off Wall Forms

The cut-off wall forms, after the idea of using panel construction had been given up, consisted of sections built in place, using 1 x 6-inch shiplap with 2 x 4-inch studs and double 2 x 4-inch wales spaced about 3 feet apart but somewhat variable because of the great difference in the height of the forms even within short distances. The forms were held by Malleable Iron Co. form ties with ½-inch inside rods.

Pumping Concrete Downhill

A large double-acting Pumpcrete with a capacity of 60 cubic yards per hour was set up near the top of the cut-off trench and received concrete from a fleet of truck mixers which delivered directly to the agitator hopper of the Pumpcrete. The concrete was delivered through an 8-inch Pumpcrete pipeline on a wood trestle for a distance of 350 feet and with a drop of 75 feet in the line.

The larger Pumpcrete delivered the concrete to the agitator hopper of a Pumpcrete 120 which worked on a 6-inch line delivering the concrete varying distances with a maximum rise of 50 feet to the cut-off wall forms. To get to the top sections of the forms on the canyon walls, the double-acting Pumpcrete was moved around the top of the cut-off trench and set up on the right side of the canyon.

C. & E. M. Photo

Equipment for foundation grouting at Anderson Ranch Dam: the mixer on the platform, oil drum agitator below and the battery of four grouting pumps.

Nicaraguan Highways Developing Rapidly

Contemplated road projects did not at first find general public favor in Nicaragua, according to Luis Felipe Hidalgo, well-known Nicaraguan writer who is now visiting the United States, but as the programs actually developed, support for the movement increased. It was last summer when the first work in connecting the coasts of Nicaragua began. United States engineers established a camp and work started. A line was cleared and a dirt road was cut through from Las Banderas to El Rama, a distance of more than 1,243 miles. Upon completion of this initial phase of the work a diplomatic and official party traveled by automobile from Managua to El Rama. The conversion of the dirt road into a paved highway is now continuing with economic assistance from the United States.

Meanwhile, work on the Pan American Highway in Nicaragua is going forward without relaxation. So far, many miles have been completed and indications are that the work will be completed sometime in 1943. The Nicaraguan link of this highway will run through the Republic of Rivas on the border of Costa Rica to Nueva Segovia, bordering the Republic of Honduras. In between these two regions the highway will pass through Carazo, where the capital, Managua, is located.

A New Curing Bulletin

A new 4-page illustrated, fact-giving bulletin on Ritecure, a colorless membrane for curing concrete, has just been issued by The Johnson-March Corp., 52 Vanderbilt Ave., New York, N. Y. Full pages are devoted to tests and facts regarding Ritecure which are of especial value to users of membrane concrete material curing compounds. Ritecure was originally introduced in 1933, and pioneered this field.

Copies of the bulletin, which reproduces ten photographs on its back cover showing Ritecure at work, may be secured direct from Johnson-March.

New Bridge and Curb At Denver Entrance

A 2-Mile Cut-Off, Started Two Years Ago, Now Assumes Importance as Access Aid, Four Grade Crossings Out

(*Photos on page 56*)

✦ TWO years ago, when restrictions on steel were far from one's thoughts, the Colorado State Highway Department planned a new 2-mile cut-off at the north entrance to Denver, sorting traffic which formerly was badly tangled and connecting U. S. 85 and U. S. 6 at a well-conceived cloverleaf. At that time a 362-foot I-beam bridge was built over Sand Creek as the initial step in the project.

Numerous problems delayed the immediate completion of the project, but with the entry of the United States into the global war, the Army urged speedy completion of the work to facilitate traffic to and from certain new and enlarged military projects. Four new underpasses which eliminate crossings at grade of the Union Pacific and Burlington Railroads were hastened to completion, the dividing reflecting curb constructed for the four and six-lane roadway, and cloverleafs completed to do away with left turns across traffic.

Ground Water Troubles

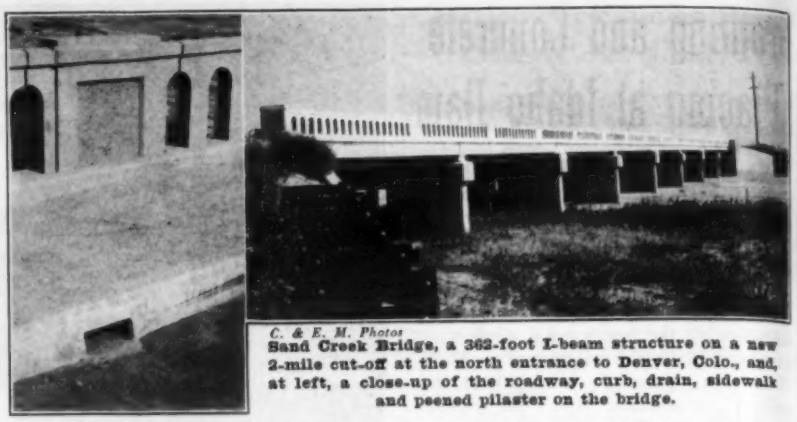
The drainage of the elongated underpass which carries the roadway beneath the four structures for a total distance of 3,000 feet was a problem. The normal gravel base course of this section would have been 8 inches beneath the paving but because of the fine grained sand, which had no bearing when wet, below the roadway an additional 12 inches of the subgrade was removed and backfilled with surfacing gravel. The water table is only 4 feet below finished grade, which added to the difficulty of draining the area after a rain storm. It was inadvisable to lower the ground-water elevation within the underpass area because of certain industrial requirements between the construction and the river, so the use of perforated pipe underdrains along the roadway was abandoned and the entire area allowed to drain to a waterproof sump at the north overpass structure. From there a pump removes the water to the drainage system flowing to the river.

Reflecting Curb

Two types of reflecting curb were used in this section of underpass to guide traffic past the piers of the structures between the opposing lanes of the roadways. The difference in particular is that the reflecting faces are shorter in the section beneath and close to the structures than in the longer portion of the work at ground level. The curb is of concrete cast in place in wood forms and with the reflecting elements cast at the same time, using wood inserts on the beveled section at the top of the form. The curb is 18 inches high, 12 inches wide with the top flat for 8½ inches and the reflecting section beveled at 45 degrees in the remaining 3½ inches. The curb is set on 2 inches of sand cushion.

The reflecting surfaces are 10 inches long and indented 1 inch at the end with 2 inches of flat curb between the indented sections. The curb is exposed for the top 6 inches above the roadway surface, placing the reflecting surface only ¾ inch above the roadway. This causes considerable dirt, both dust and a slurry in wet weather, to be deposited in the reflecting surfaces by passing cars. In order to increase the effectiveness of the reflecting units, the maintenance forces of the Highway Department paint

(*Concluded on page 41*)



C. & E. M. Photos
Sand Creek Bridge, a 362-foot I-beam structure on a new 2-mile cut-off at the north entrance to Denver, Colo., and, at left, a close-up of the roadway, curb, drain, sidewalk and peened pilaster on the bridge.

Combustion-Chamber Design, Oil Engines

An 88-page book, "Combustion-Chamber Design for Oil-Engines", by Paul Belyavin, has recently been published simultaneously in London, Toronto and Cleveland. While few of our readers are concerned with redesigning combustion chambers, many will study a book of this type with interest to secure a better conception of efficiency in oil engines as related to a rational design of combustion chambers.

The book may be secured from The Sherwood Press, Box 552, Edgewater Branch, Cleveland, Ohio, at the list price of $1.50.

A Contractor's Want Ad

Sanderson & Porter, New York City contractors, engaged in the construction of a plant at Pine Bluff, Ark., inserted the following "Help Wanted" classified advertisement in the New Orleans *Times Picayune*:

"Wanted: Steamfitter welders, steam-fitters, plumbers. Sanderson & Porter, engineers and contractors, Pine Bluff Arsenal, Pine Bluff, Ark."

According to "Short Takes" in a recent issue of *Editor & Publisher*, Sanderson and Porter received the following letter of application: "Understand you is in need some sandersons and porters at the plant. I am a porter and like know how much you pays. Also what is a sanderson and how much does it pay?"

Galliher Made Columbia's Executive Sales Manager

W. I. Galliher, formerly Director of Sales, Columbia Chemical Division, Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh, Pa., has been appointed Executive Sales Manager of the Columbia Chemical Division, manufacturer of heavy industrial chemicals including alkalies and calcium chloride. Mr. Galliher will maintain his office in Pittsburgh.

LETTINGS for highway projects are held in the attractive Senate Chamber of the Nebraska state capitol at Lincoln. The few contractors in this picture results from the fact that practically all construction equipment in the Nebraska area was in service on war projects during 1942.

Wardner G. Scott, State Engineer.

Nebraska H

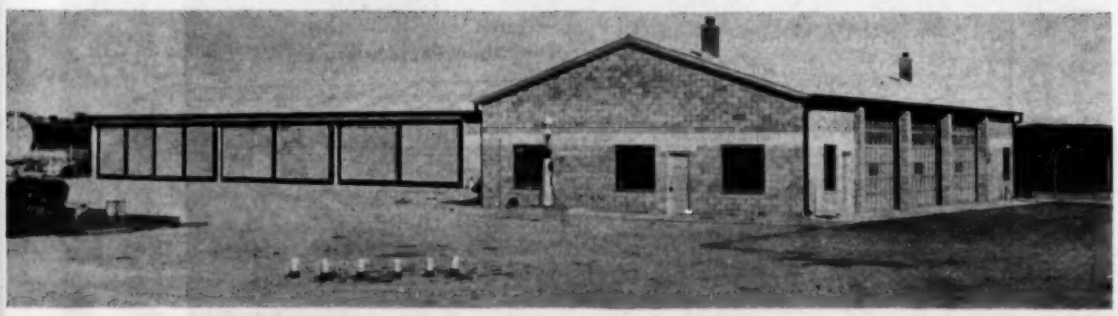
Personnel and co
Of Nebraska Hwy
And Irrigation Pro
Round Trans

GOOD ROADS. Above, concrete paving on U. S. 6 in eastern Nebraska and, at right, bituminous paving on Nebraska 20 in Smiley Canyon in the northwestern section of the state.

• • • —

DISTRICT SHOP

and patrol shed located at McCook, Nebraska, shown below, where District highway equipment is stored, greased, and regularly inspected to keep it in condition for service for the duration.



SNOW is not a serious problem in Nebraska as a whole, the western sections of the state have a rather heavy [illegible] snow-removal equipment, including rotaries, is kept in [illegible] operation. above, one of the rotaries owned by the Nebraska Department of [illegible] and ing a drift formed on a highway after the initial [illegible] been

A. W. Bohner, Construction Engineer.

ROADSIDE DEVELOPMENT. An interesting treatment of the approaches to a protected spring in a new roadside improvement area in southeastern Nebraska, just prior to final grading and planting.

F. H. Klie[illegible]

M. B. Jones, Chief Highway Engineer.

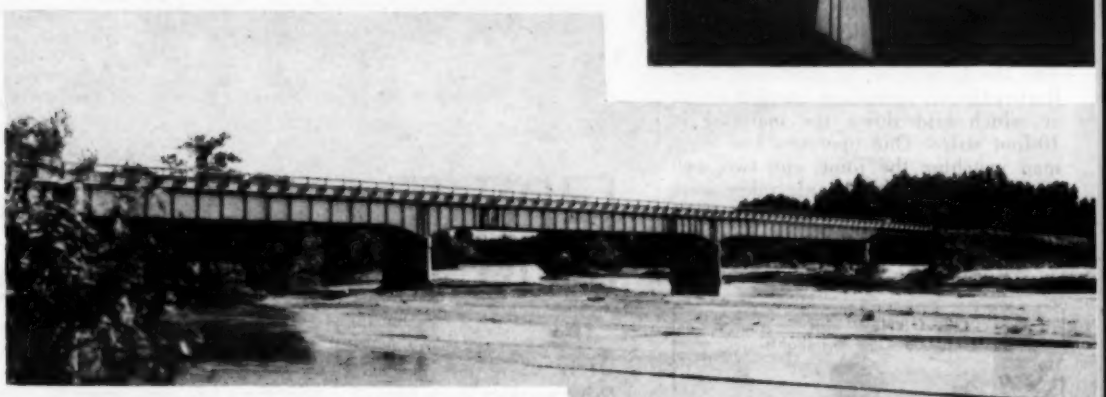
...ed Highways

...accomplishments ...ta...tment of Roads ...tion Providing Year- ...ansition Facilities

STATE SHOPS at Lincoln where complete motor overhauling and other heavy maintenance and repair operations on highway equipment are done for all districts. A large materials yard is located near this well-landscaped shop site.

Public Roads Administration Photo

GRADE SEPARATION. Above, a grade-separation structure built on a 3-degree horizontal curve south of Omaha, Nebraska. At right, final operations on a grade separation which carries Route 92 over Route 30 and the Union Pacific RR in central Nebraska.



BRIDGE. A multi-span steel-girder structure, built in 1938, across the Elkhorn River between Winslow and Uehling in eastern Nebraska.

...a whole ...he western and northwest- ... heavy ...uring heavy blizzards, all ...pt in ...peration. In the picture ...Depart... and Irrigation is remov- ...e initia... been completed.

... Milst... ...nce Engineer.

ROAD MAGNET. Two of these outfits have been built in the state shops and operated on the gravel roads of the state highway system for a number of years. The average pick-up of metal is slightly less than 12 tons a season.

A. M. Gaddis, Design Engineer.

Laying Hot-Mix Top On Airport Runways

(*Continued from page 2*)

x 34 feet long and were served by a Vortex blower and dust collector. Fuel oil was the source of heat for the driers. The Lippman hot elevator was open and raised the material from the driers to a two-deck Lippman vibrating screen serving three bins. A Taylor dual-recording pyrometer plugged into the discharge of each drier gave a continuous record of the temperatures of the two streams of hot aggregates.

The productive capacity of the plant depended on a pair of Cummer 2,000-pound pugmill mixers, each complete with its Kron scale for aggregate and a duplicate scale for the asphalt weigh bucket. There were two mixer men operating the hand levers for control of delivery of the aggregates and asphalt to the weigh buckets. The pug mixers were driven by two 40-hp Allis-Chalmers slip-ring electric motors. After the one-minute mix of the asphalt and aggregates, the pugmill gates were opened by pneumatic power furnished by an electric-driven air compressor.

The dust for filler was delivered from the dust house by a screw conveyor. The batches were made up on the following percentages:

BINDER COURSE	
Asphalt, 100 to 120-penetration	6 per cent
Dust, 200-mesh	5 per cent
Aggregates	89 per cent
SURFACE COURSE	
Asphalt, 100 to 120-penetration	7 per cent
Dust, 200-mesh	6 per cent
Aggregates	87 per cent

Laying Binder and Top

The runways were built on a foundation of crushed limestone rolled to compaction by 10-ton steel-wheel rollers under another contract. This base was primed by the paving contractor, using 0.33 gallon of MCO per square yard. The binder course was laid to furnish a compacted thickness of 2 inches and the top 1 inch.

The 100-ton an hour production of the twin-mixer plant was hauled away six batches to a truckload. The truck bodies were sprayed with oil every three or four trips to prevent the hot-mix sticking to them. The trucks dumped their loads into the hopper of a crawler-mounted Barber-Greene spreading-tamping-finisher which laid down the material in 10-foot strips. One operator, one wing man matching the joint, and two men carrying back to the single raker were all that were required for the speedy production of runway with this machine. A 10-ton Galion 3-wheel roller did the breakdown rolling, followed by a Buffalo-Springfield 10-ton tandem for the final and cross rolling. The Barber-Greene machine was operated at a forward speed of 28 feet per minute on this job.

C. & E. M. Photo
Placing binder course on a 150-foot wide runway by a Barber-Greene spreading-tamping-finisher.

The binder course, as well as the top course, was swept by a rotary power broom before the next course was applied. No brooming was done to the sub-base before priming or to the primed base, as the broom tore into it too much. The final operation was the sealing of the top with 0.25 gallon of RC-3 per square yard over which 15 pounds per square yard of ¼-inch stone was spread by a Buckeye spreader and then rolled by a 10-ton steel wheel roller.

Personnel

This runway was paved with two courses of hot-mix asphalt by contract under the direction of the U. S. Engineer Department. In the interest of national security, the location and mention of personnel are omitted.

Anti-Diversion Move By Maine Road Builders

The Maine Good Roads Association at its recent meeting decided to sponsor an amendment to the Constitution of the State of Maine to prevent the use of highway revenues for other than highway purposes. This constructive move is part of a six-point program adopted at its December meeting at which a Committee was appointed to raise funds with which to engage legislative counsel.

A Comprehensive Manual On Servicing Tractors

A new service manual, complete in every detail, on the care, operation and maintenance of Allis-Chalmers Model M 32-hp gasoline-powered tractors has recently been issued by the Tractor Division, Allis-Chalmers Mfg. Co. This large manual of 143 pages and 230 illustrations contains cross-section views and exploded pictures to assist the reader in a clear understanding of all operations. It is written in simple, understandable language, and will be most helpful to mechanics entrusted with the care of Model M tractors.

Copies may be obtained at $1.00 each, postpaid, from the Industrial Service Department, Tractor Division, Allis-Chalmers Mfg. Co., Milwaukee, Wis.

No A. G. C. 1943 Convention

Instead of the Twenty-Fourth annual convention, the Associated General Contractors of America will hold a meeting of the Governing and Advisory Boards at the Drake Hotel, Chicago, Ill., February 15 and 16, 1943. The decision to hold the meeting of the boards instead of the convention was made as an aid to the war effort. The Executive Committee had made the proposal, and asked the membership to vote on it. Voting was overwhelmingly in favor of cancelling the larger convention to save transportation.

Installation of new officers and directors for 1943 will take place at the meeting of the Governing Boards. The Fall Board meeting nominated Oscar B. Coblentz, Baltimore, Md., for president to succeed Dan W. Kimball, of Grand Rapids, Mich. William Muirhead, Durham, N. C., was nominated for vice president to succeed Mr. Coblentz.

New Federal Calendar

Readers who for a number of years have put to good use the Miss Federal calendar will be interested to know that the 1943 edition may now be secured direct from the Advertising Dept., Federal Motor Truck Co., Detroit, Mich.

Thirtieth Anniversary For Hercules Powder Co.

January 1 of this year marked the 30th anniversary of Hercules Powder Co., Wilmington, Delaware. In his year-end report, Charles A. Higgins, President of Hercules, pointed out that while the major production of the past year has been military explosives for the government, its diversified chemical business has exceeded its peacetime volume to meet the demands of the war program. To supervise construction and operation of six government-owned ordance works for the production of smokeless powder, TNT, other military explosives, and ammonia, the company's Explosives Department, maker of dynamite for industrial uses since 1913, has been expanded about 1,000 per cent. At the same time, Hercules production of dynamite, blasting caps, and other commercial explosives, was increased to supply the demands of mining and construction industries expanded by the war.

In other fields of chemical operations, which before the war had amounted to four-fifths of Hercules' business, the company retained its position as the nation's largest producer of cellulose products, wood naval stores (rosin, turpentine, pine oil, and derivatives), and of paper making chemicals (such as rosin size).

Our highway departments should be resourceful in wartime and prepared for peace.—Thos. H. MacDonald, Commissioner, P.R.A.

Philadelphia Dealer Dies

Alfred C. Rimmer, Treasurer of the Furnival-Rimmer Co., Philadelphia, Pa., distributor, died on December 17, 1942. Born in England, he was educated in the New York City schools. After work with shipbuilding companies, including Bethlehem Steel Co., and The Federal Shipbuilding Co., he became connected with the Northwest Engineering Co. when they were in the shipbuilding business during the last war.

He continued with Northwest when they entered the shovel and crane fields, and was their New York representative till 1929, when he became associated with P. A. Ransome, as a partner in Giles & Ransome, Philadelphia, Pa. This partnership was dissolved in 1933, and Mr. Rimmer returned to Northwest Engineering Co. as their sales representative in Atlanta, Ga. In March, 1940, with G. E. Furnival, he formed the Furnival-Rimmer Co.

Peerless Pump Engineer Named for New Position

James M. Hait, for many years Chief Engineer of the Peerless Pump Div., Food Machinery Corp., Los Angeles, Calif., has been made General Manager of a new division of that company to be known as the Division of Procurement and Engineering. This Division has been formed to take care of the Food Machinery Corp.'s work in the development of amphibian tanks for the U. S. Government.

Field Organization For Tar Maintenance

Methods and Equipment for Annual Treatment of Low-Cost Roads in Connecticut

(*Photos on pages 1 and 56*)

✦ WITH the belt-conveyor-type spinner sander used by the Connecticut State Highway Department, a crew of four men is able to apply sand for the annual sealing operation on 10 miles of surface-treated road per day. This operation, using 0.13 to 0.20 gallon of tar per square yard, according to the condition of the surface over which the sand is spread, is sometimes repeated during the late summer to put the road surface in prime condition for winter. Shoulder maintenance is done in the same manner with a slight adjustment in the sanding unit.

The use of tar as an essential road-maintenance material is continuing in New England because of the large local production of this bituminous material, permitting delivery by short hauls in tank trucks.

The Sander

The sander is built on a structural steel frame carrying an 18-inch belt 25 feet long. At the rear, a removable sheet-metal hopper is set over the belt immediately below the tail-gate of the truck which is restricted by corner boards in the truck so that the sand is delivered from an opening about 20 inches wide into the top of the hopper which measures about 4 feet x 15 inches. The bottom of the hopper chute has a semi-circular hole which delivers a uniform windrow of sand to the belt which runs the full length of the truck beneath the axles to a spinner-type spreader at the front of the truck. The belt and spinner are driven by a 12-hp Continental engine through an adjustable belt so that the speed can be made faster or slower when driven by the engine controlled by a governor, or the engine may be speeded up by hand to spread sand wider for a short distance.

The spreader is suspended front and back from hooks on the truck body. A hook at the rear of the truck is used with a short chain and pair of tongs to hold the structural steel frame just clear of the ground. The frame is lifted by a wooden bar to enable the tongs to be attached to the frame. At the front, the frame is suspended by two chains, one on either side, which are attached to hooks on the truck frame, and then the entire frame is raised by a hand-operated hydraulic jack and levers so that it is readily adjustable as to height.

Two adjustable guards, or fins, immediately over the spinner make it possible to determine the general direction of spread. For shoulder work a special sheet-metal guard is placed over the entire spinner so that the sand is thrown only to the side. When armor-coat work is being done in which RC-5 asphalt or RT-10 road tar or emulsion is used at 0.25 gallon per square yard with ½-inch crushed trap rock or with 0.33 gallon per square yard of the same asphalt and ¾-inch chips, a wood guard is hung from a pipe at the front of the spinner to prevent the stone being thrown to the opposite side of the road beyond the outer edge of the application of the bituminous material.

Applying the Tar

The contract for tar for 1942 in District 8 in north central Connecticut, where this work was observed under way, was awarded to the Barrett Division, Allied Chemical & Dye Corp., which has a processing plant at Cromwell, Conn., just south of Hartford. The contract called for the delivery of the tar to tank trucks for hauling to the job from the plant. A hauling contract was awarded, the contractor using 2,500 and 3,500-gallon tank trucks to deliver the tar from the plant to the site of the sealing operation. A state-owned Etnyre 1,300-gallon pressure distributor mounted on an Autocar truck then pumped the tar from the ferry trucks to the distributor. The tar is applied 12 feet wide and in sections varying in length, depending on the amount of traffic on the highway. If the traffic is light and passing points frequent, the distributor applies the tar for a distance of a quarter of a mile and then waits for the sanders to catch up. If the traffic is heavy, the distance is greatly shortened but in no case is the tar on

(*Concluded on page 49*)

C. & E. M. Photo
Feeding sand from the dump truck to the rear of the belt of a Connecticut front-end spreader.

C. & E. M. Photo
Applying Hunt Process membrane cure to the finished pavement at the Fort Leonard Wood entrance Y.

Fast Concrete Paving On Camp Access Road

(Continued from page 9)

thrashing out. At expansion joints, which themselves seem to be on the way out in many states, the load-transfer device is absolutely necessary if we are not to have the curling, heaving and other ills attendant to the heavy clay soils in the subgrade. On the other hand, we may go to the insulation layer to a greater extent in those states where there is an abundance of gravel or cheap crushed stone, to get away from the troubles of the wet subgrade with its expansion and failure to return to its dry volume again.

Because of the dry atmosphere on this job, one man kept the grade moist ahead of the paver by constant watering, and he also watched the electric power line of the Jackson spade which was used to vibrate the concrete against the forms to prevent honeycomb. The paver carried the electric unit, and the cord was strung over the subgrade, in constant danger of having its life line severed. The man watering the grade watched this carefully.

To reduce operator fatigue in turning the large wheel to raise the boom of the paver, Frank Creason devised a power-operated mechanism for this work. A power-take-off from the boom swinging mechanism was made, using a Buick differential and the universal from a Caterpillar blade. By throwing in a clutch, the swing mechanism is used to raise and lower the boom without any strain on the paver operator.

Finishing and Curing

The contractor used five puddlers ahead of the Jaeger-Lakewood finishing machine, with two additional men to carry back concrete to the second screed of the finishing machine from the first screed where there was a slight excess of grout. The finisher carried the cutting wheel for the center joint, and from a rolling bridge two men cut the transverse joints with a device that at the same time inserted the 3 x ⅛-inch premoulded strip straight across the pavement. This device is simple, consisting of two angles back to back to make the cutter for the slot. A lever at one end separated the angles by means of angled slots and machine screws so that it deposited the premoulded strip in the concrete and left it without the usual wrinkles when it is placed by hand in a previously cut slot. The transverse joints were cut at 30-foot intervals. Behind the transverse-joint setters there was a Creason-built power-operated longitudinal float in which the float can be tipped one way or the other to give the desired finish to the top of the slab. The float is pulled across the pavement slab by cables and the machine does not advance over the pavement during the transverse floating operation.

The finishers first used flat long-handled floats for making up any irregularities in the pavement behind the longitudinal float and then used Cleveland 10-foot straight-edges as drags to remove any high spots and also the excess of grout. These same men pulled a drag of burlap over the pavement and then left the finishing to the broom man, two men building lip curb and one man edging the pavement but not the joints, which permits them to ride more smoothly. At the end of the line came two men operating the tank and pressure pump for applying the Hunt Process membrane cure.

Personnel

For the subcontractor on paving, Frank Creason was Superintendent, while C. L. Crawford was Project Engineer for the Missouri State Highway Department.

A.I.S.C. Secretary Resigns

V. Gilmore Iden, who has been associated with The American Institute of Steel Construction, New York, N.Y., since 1928, and its Secretary since 1933, has resigned to accept the position of Industrial Editor of the Bureau of National Affairs in Washington, D. C. Mr. Iden has had wide experience as a newspaper correspondent in government finance and in the field of steel. He is the author of various financial and economics works and is a member of the American Trade Association Executives, the American Marketing Association, and the Engineers Club of New York.

Highway Veteran Dies

Jay T. Ellison, an Assistant Commissioner of the Minnesota State Highway Department since the establishment of the state's trunk highway system in 1921, died on Christmas Day, 1942, of a heart attack while en route from his home in St. Paul, Minnesota, to Estherville, Iowa. Mr. Ellison served as Second Commissioner and Chief Bridge Engineer from 1921 to 1925, and since that time, as Assistant Commissioner and Chief Engineer.

The years of his active life as a professional engineer span the modern era of highway progress, not only in Minnesota but throughout the nation. During his more than 30 years of service to the State of Minnesota, Mr. Ellison has served at various times as president of the International Highway Association, president of the Mississippi Valley Conference of State Highway Departments and as vice president of the American Association of State Highway Officials, being a member of the National Executive Committee of the latter association until the time of his death.

8 Pounds Won't Break It

Out on the job an engineer or surveyor does not carry a pencil sharpener, and the famous "engineers' points" made with jack knives are notorious. Time cannot be lost in drafting rooms today resharpening pencils, so the news from the Reliance Pencil Corp., Mount Vernon, N. Y., that its new Templar DuroLead won't break until nearly 9 pounds pressure is put on it is welcome.

A special scale test has been made to prove this statement, while an average of four or five pounds is breaking point of most pencils. The Templar DuroLead is available in six degrees of hardness, ranging from No. 1 to No. 4. If you want to test out this pencil yourself to be sure, write to Reliance for a sample pencil which will be sent promptly to those mentioning this item.

The Dixie-Vortex portable water tank and cup dispenser.

Clean Drinking Water Aids Job Efficiency

Colds and other contagions were passed around by the old common drinking cup and hose nozzles used by workmen to get drinking water. The modern cleanly way of providing drinking water for workmen is by the individual drinking cup. Dixie-Vortex Co., Easton, Pa., has developed a portable water tank, with waste receptacle attached, which can be carried easily by any water boy. The tank, of four gallons capacity, is made of galvanized metal with gray enamel on the outside. A snug fitting cover on a chain keeps out dust and dirt and a push-type spring faucet prevents waste.

A riveted lug on one side of the tank is provided for the insertion of a double unit dispenser and waste cup receptacle. An insulating jacket may be purchased for the water tank to keep the water cooler in hot weather and to help prevent it from freezing in winter. The tank measures 12 inches in height, 14½ inches long and 7 inches deep.

The dispenser for the Vortex cone-shaped cups is pull-type. After being used, the cups are dropped in the waste receptacle, bottom up, and when it is filled the cups may be removed by opening the latch bottom.

A folder giving all details of the Dixie-Vortex portable water tank is available by writing to the manufacturer and mentioning this text.

Economical Surfacing For Secondary Roads

Wyoming has a large mileage of both primary and secondary roads on its state highway system, which, up to 3 or 4 years ago, was merely gravel surfaced because the traffic of 100 to 200 vehicles a day did not warrant any further improvement. Engineers of the State Highway Department, however, felt that if a surface could be developed that would not cost more than $1,500 a mile, the savings in annual graveling and frequent blading would make the treatment feasible.

With considerable experience behind them in laying oil-mat surfaces on main highways, with a chip seal which armorplated the road against raveling, they devised a treatment that has been highly successful. Since no road surface is better than its base—for long, at least—the roads to be treated were built to a standard section with a base of selected material 6 to 12 inches thick, depending on the character of the local material as shown by careful soil tests. The base or leveling course was primed with 0.4 gallon of MC-0 or MC-1 per square yard, and a penetration of ½ to ¾ inch into the surface was secured to bond the top of the gravel. This was allowed to cure and vehicles used the road continuously.

Then a chip seal was applied by pressure-spraying 0.33 gallon of RC-4 per square yard and spreading 20 pounds per square yard of chips with ½-inch maximum screen size. This was rolled by a steel wheel roller and then finished by a rubber-tired roller. The results have been excellent and to date over 500 miles of this type of treatment have been put down on primary and secondary roads.

C. & E. M. Photo
Two Cleveland jackhammers drilling holes for the dynamite being prepared in the background and shot with Manasite blasting caps fired by a hand blasting machine.

Economy Blasting At Big Army Depot

Heavy Grading Divided Into Two Contracts; Blasting of Rock Done by Man Trained On Job Who Became Expert

EXPERT "powder monkeys" are always scarce, and even good ones not easy to find. When there is need for unusual care, as in the midst of extensive warehouse construction for the Army, with several contractors rushing their work for early completion, you just cannot afford to shoot high, wide and handsome. Fireworks are out of date, and so are big shots in close quarters.

To clear areas for warehouses 1,200 x 180 feet for a large Quartermaster Depot in the southwest, the first grading contract called for moving 390,000 cubic yards of dirt and some 61,000 cubic yards of rock, while the second contract required the removal of 600,000 cubic yards of earth and 42,000 yards of rock in grading for buildings, railroad track and streets. On this contract over 7,000 yards of rock had to be blasted in trenches for utilities.

The first powder monkey on the job was of the spectacular type—plenty of dynamite, big shot, and pick up the pieces! That procedure was neither safe nor economical. He was fired, but there was no one to take his place. A U. S. Engineer Department senior engineer of wide experience in rock work, starting when he was in knee pants, selected a mild little Mexican who came to be known as "Chili", worked with him for several weeks and turned out a really expert blaster. They moved 61,000 cubic yards of rock with 27,000 pounds of 40 per cent gelatin dynamite, shooting against brick walls part of the time and in one case within 2 feet of a concrete wall less than 15 days old. There were no cracks.

We watched Chili load holes 4 feet deep in moderately hard rock with 1½ sticks per hole and shoot about twenty at one time. There was a slight puff and the rock was well broken, none scattered beyond the immediate area of the blast, and none went into the air more than 5 feet. Good shooting, Chili!

The Rock Outfit

The rock-drilling outfit consisted of two Schramm 210-foot portable compressors with Buda engines, each running two Cleveland jackhammers with Timken detachable bits. They drilled 4-foot holes most of the time, although deeper ones were required for some of the utility trenches. The holes were loaded with slightly less than 1½ sticks of Atlas Extra dynamite of 40 per cent gelatin and shot with Manasite electric blasting caps fired by an Illinois Powder Mfg. Co. hand blasting machine.

The Grading Outfit

The amount of dirt moved, as outlined in the initial paragraphs, required a good showing of effective equipment. The two contracts, including the compaction of the filled areas, were operated with the equipment listed below: one Marion 1-yard dragline; one Northwest 1½-yard dragline; two Lorain 1¼-yard draglines; one Bucyrus-Erie gas+air

C. & E. M. Photo
"Chili", the powder monkey, loading a hole with Atlas 40 per cent dynamite to clear an area for warehouses at a QM Depot in the southwest.

1½-yard shovel; one RD8 tractor with a 12-yard LeTourneau Carryall; three Allis-Chalmers L and LO tractors with 7-yard Continental scrapers; four Caterpillar industrial tractors with rubber tires pulling 8-yard LaPlant-Choate Carrimor scrapers; two 12-yard Tournapulls; four Caterpillar power graders with 12-foot blades; one Austin-Western 99 power grader; one 10-ton Austin-Western 3-wheel roller; one Buffalo-Springfield 10-ton 3-wheel roller; and six sets of Servis sheepsfoot rollers.

Personnel

The grading operations at this southwest Quartermaster Depot were performed by contract, using some government-owned equipment, under the direction of the U. S. Engineer Department.

In the interest of national security, the location of and mention of personnel connected with U. S. Army construction are omitted.

Which bonds will you have—the bonds of defeat and slavery, or War Bonds, Victory and Peace?

Well-Equipped Shops In Kansas Division 1

(*Continued from page* 13)

magneto tester, a Van Norman valve refacer and a heavy sheet-metal covered bench for general service. Additional equipment in the corner shop includes a Rimac valve-spring tester, and a Kwik-Way boring bar for cylinders.

Next is the elevator to the floor below, desks for the Chief Mechanic of the Division and the Shop Foreman, a drinking fountain and a long wash fountain. In the northeast corner is a circular stairway to the floor below where the heavy equipment is brought in at a lower street level for repair.

On the floor are a Manley portable motor stand to speed repairs, and an Airco portable acetylene welding outfit. Here also is a novel idea that has saved many an hour for the mechanics—a movable metal-top work bench that can be taken anywhere in the shop close to any piece of equipment that is not in one of the regular repair stalls.

Down the east wall and well-lighted by high windows are metal-top benches for the automobile and truck mechanics. Each mechanic has a bench and a repair stall, marked off on the floor by heavy paint lines, and on the bench is a sign giving his name and special rating. The benches have drawers and shelves below for storage of parts not needed during overhaul. There is also a cupboard at each bench for the mechanic's own small hand tools while the state furnishes all special tools. Drop-cord plugs along the wall provide for close lighting while high reflector lights illuminate the entire area of the shop fully. There are two double exhaust pipes in this area, and another in the southwest section of the shop, with flexible tubing to be attached to the exhaust of any engines which are being tested. Heavy machinist's vises on each bench and other equipment such as a Black & Decker bench grinder and buffer, a Sunnen bushing grinder and a Sioux valve grinder and refacer are found on these benches for the use of the mechanics. A Brunner air compressor in the southeast corner provides air for all services in the shop.

Along the south wall are another bench and a Rahn-Larmon 15-inch x 12-foot lathe. On the bench are a ½ and ¼-inch Black & Decker electric drills and drill press rig for both drills, a Master lathe converter which is one of the handiest pieces of equipment in the shop as it makes the lathe suitable for milling, grinding and shaping, can cut keys, and fits any standard lathe. At the center of the south wall is an overhead door with a clear opening 16 feet wide and 14 feet high. A similar door is installed in the center of the west wall.

Beyond the door in the south side is a spare bench with the exhaust connection, and in the corner the lubricating-oil dispensing stand. In front of the oil stand is a Curtis 4-ton air lift for equipment and an Alemite pneumatic lubricating system. Along the west wall is a bench with tire repair tools, an A-C spark-plug cleaner, and the stock of distilled water for the batteries. An overhead crane with a span of 15 feet runs the entire length of the building in front of the mechanics' repair benches and is equipped with a Wright ½-ton screw chain hoist.

C. & E. M. Photo

The repair shop on the upper level of Division 1 Headquarters of the State Highway Commission of Kansas. At left, a Manley portable motor stand and, at right, an Airco portable acetylene welding outfit.

Heavy Equipment Shop

Below the shop just described is the heavy equipment repair shop, particularly for motor graders and tractors, as well as the welding and paint shops. The paint shop is in the southeast corner and is big enough for a motor grader. It is shut off by a heavy canvas curtain and has a large exhaust fan in the wall at ground level, which is near the top of the shop at this point. In the next section at the south end of the shop are wall boards on which are mounted the special tools for all makes of graders and tractors owned by the Division, and on the floor a Weaver 60-ton mechanical press. A heavy pipe rack at the west end of the shop is used to store salvaged tire chains repaired and ready for reuse.

At the extreme west end of the shop is the wash rack where a Hypressure Jenny is installed for cleaning equipment before work is started on repairs and before repainting. A radiator bath with a heater has been built by the shop forces

(*Concluded on next page*)

C. & E. M. Photo
Checking the overhaul of a Diamond T truck in the repair shop of Division 1, State Highway Commission of Kansas, at Topeka.

Garage and Shops Designed for Utility

(Continued from preceding page)

for using an Oakite solution for cleaning radiators. The welding shop at this end of the building has a pre-heating furnace with natural gas and a 300-ampere Wilson electric welder. A metal welding table completes the equipment of this shop. Next is the blacksmith shop, minus the forge and a 50-pound trip hammer which were installed in the yard because of the smoke and noise respectively. A power hack-saw, a 21-inch Canedy-Otto drill press with a stand for all the sizes of twist drills, and another Airco acetylene welding outfit complete the equipment in the blacksmith shop.

A Kewanee boiler in the basement heats the entire building through unit heaters installed in offices and shops. A stockroom is located adjacent to the boiler room. Just outside the boiler room, where there was room for another piece of equipment, is a 2-hp Marschke pedestal grinder.

A feature of this lower shop is a stockroom 3 feet above floor level so that trucks can drive in and deliver heavy materials and parts easily. Such stock as chains, anti-freeze, etc., are stored here; in other words, materials that do not move rapidly through the stock accounts. A large wash room, toilet, shower and the domestic water heater are located on the north wall of the shop and just outside this is the precious store of tires behind locked doors in a heavy wire cage. A piece of equipment to replace one which proved dangerous was made in the shop for handling heavy engines and other parts. It is a double A-frame of pipe with an I-beam across the top supporting a 3-ton Yale hoist. The original portable hoist was made of wood and was discarded when it was found to be infested with termites. At the end of the shop is a welded frame of pipe for storing the stock of tool steel, each rack section being labeled with the sizes of the pieces in that rack. Two Manley floor jacks for autos and equipment are used in each shop.

Personnel

Division 1 garage and shops are under the supervision of W. K. Dinklage, Division Engineer, State Highway Commission of Kansas, with H. C. Green, Assistant Division Engineer in the field and M. E. Trueblood, Assistant Division Engineer in the office. H. R. Hanna is Division Mechanic and H. N. Lindgren, Shop Foreman.

New Marion Official

John P. Courtright, for the past year Director of Sales of Marion Steam Shovel Co., Marion, Ohio, has been named Vice President in Charge of Sales. Mr. Courtright's sales experience with Marion dates back to 1927 when he became a salesman for the company in the Chicago district territory. In 1936 he was made District Manager of that territory, and then in 1937 became Sales Manager over all districts, moving his headquarters to Marion, Ohio.

Timber Products At War

A book of news pictures showing the jobs the timber industries have done and are doing to forward the nation's war effort has recently been published by the Timber Engineering Co., 1319-18th Street N. W., Washington, D. C. This book, "The Forest Fights", contains some 200 photographs with brief descriptive copy in its 48 pages covering Army, Navy, Air Corps, industry, housing and training camps.

In all the pictures wood is shown in some war use, major or minor. Some show uncommon or revived uses of wood, improved engineering methods in timber, research that is developing broader uses for wood, and the equipment and methods that are protecting the forests against fire. Copies of this book may be secured direct from Timber Engineering Co. by mentioning this review.

Your Rubber Belts Must Serve Longer

Transmission, Conveyor and Elevator Types Must be Nursed Through War; Hints And Helps to Aid You

✦ RUBBER belting of all kinds, transmission, conveyor or elevator type, is one of the most essential products in service today in war plants and in many plants operating on construction work. Since it is made of a war-scarce material, great care should be taken to make it last as long as possible. Following the proper rules on selection, installation and care will not only insure efficient operation, but will likewise save a commodity vital to the war effort.

Transmission Belting

You should observe the same precautions in storing transmission belts that you do with all items of mechanical rubber goods. In other words, choose a cool, dry, dark location away from ozone-producing electrical discharges.

When installing the belt use extreme care that the ends are cut absolutely square and be sure to use the correct belt fasteners. If you aren't sure consult a belt sales engineer.

Be sure to arrange the drive so that the belt runs fully on all pulleys and does not run over the edge of them. Run endless belts in the direction indicated on the outer cover and run them with the brand on the outside away from contact with the pulley. On quarter-turn drives the following procedure is sometimes used to equalize wear and stress. When the ends of the belt are fastened together, one end is turned through 180 degrees so that edges and sides are reversed each time the joint passes over a pulley. When belts of this type undergo their final cure, they are put under carefully predetermined tension to provide a resilient safety factor in the operating belt. Therefore, adjust the tensions carefully to avoid over-stressing the belt. A too-tight belt not only destroys itself quickly but at the same time ruins bearings, and throws unnecessary strain on other driving equipment.

Make careful periodic examinations of transmission belting to be sure that the belt tensions are kept at the lowest possible points consistent with efficient driving. At the same time, check the alignment of shafts and machines which may change if buildings or foundations settle.

Use no belt dressings since they contain oils which are injurious to rubber belting. In fact, exercise continuous care that oils and greases of all kinds do not come in contact with the belt. If belt surfaces become contaminated with dust or swollen with grease, they should be washed carefully with common yellow laundry soap and water. Belts operating in atmospheres of fine dust sometimes take on a hard, glazed surface on the pulley side. This can be corrected by holding a cloth, lightly dampened with gasoline, against the pulley side of the belt while it is running. This operation should be guarded against possible sparks which would cause fire.

Always wait until machinery stops before removing belts from drives. Often the practice of throwing belts while they are in motion results in sharp twists or bends under tension which will prepare the belt for an early breakdown.

Conveyor Belts

Many construction projects use long, large and heavy conveyor belt installations for the handling of aggregates. Careful handling of the belt during installation will pay large dividends in trouble-free service. It is necessary to be especially careful about creasing, folding, straining, or subjecting the belt to sharp bends which may break the carcass and lay the groundwork for future failures. In the design of the installation, there are several things which, taken into account, can add materially to productive belt life. One of these is the arrangement of the facilities by which material is loaded onto the belt. A loading chute with a V-shaped notch cut in the end will save the belt a great deal of wear at this point by discharging fine material first, so it can become a cushion for the impact of heavy destructive lumps. The same thing can be achieved by the installation of a grizzly screen made of non-clogging wedge-shaped bars between which fine material can drop first on the belt.

Even without an arrangement of either of these types, material which is to fall any distance onto a conveyor should be retarded by baffles of spill plates which can be formed of rubber-covered chute lining or even lengths of old conveyor belt. In any event, avoid direct loading impact on the belt and arrange the heel of the loading chute so that it is 4 to 6 inches ahead of an idler. This will allow the belt to accommodate whatever impact there is by flexing instead of being battered directly on top of an idler.

On heavy duty installations, idlers in the vicinity of the loading point should be either rubber-covered or equipped with rubber disks, or be rubber-mounted assemblies. In the majority of cases, the two former expedients are preferable since they cushion the loading

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Features of Project At Entrance to Denver

(*Continued from page 26*)

them white periodically and at these times the faces are cleaned of the deposited dirt.

The wood forms used for the construction of the curbs were about as simple as could be devised, quite in contrast to the expensive forms required in some states using this type of curb. The sides of the forms were 2 x 8-inch lumber oiled to prevent the concrete sticking to the faces and with the top piece of lumber placed on an angle to form the bevel and carrying the wedges of wood that form the indented reflecting surfaces. Pins of old reinforcing bars were used to hold the forms against moving at the bottom and then, at intervals of about 3 feet, 2 x 4-inch stakes were driven into the ground and tied across the curb by rods with handles at one end to screw up the tie tight. At the top was a pipe spacer to prevent the form being pulled in too tight and to keep the two faces of the curb parallel.

Personnel

The contract for the bridge over Sand Creek was completed by the Lawrence Construction Co. of Denver, Colo., at a contract cost of $97,500. The work on the grading and the concrete for the underpasses was divided between J. A. & N. M. Monaghan of Denver, Colo., on grading and A. A. Horner, also of Denver, on concrete, including the curbs. The cost of the by-pass complete, including the Sand Creek Bridge, the four underpasses, and the grading and surfacing of the 2-mile roadway, was $490,000. The work on this project was done under the direction of Chas. D. Vail, State Highway Engineer, with C. H. Green as Resident Engineer for the Colorado State Highway Department.

C. & E. M. Photo

Four new underpasses eliminating railroad grade crossings at the north entrance to Denver, Colorado.

State Highway Depts. Reduce Gas-Tire Use

The requirements of ODT Order No. 21 for Certificates of War Necessity for state highway department equipment was the subject of a pre-convention discussion by delegates of the A.A.S.H.O. in St. Louis. The effects of the order on state highway departments will be reflected also in county organizations. The order, originally drawn up for commercial carriers, requires much information never recorded for motor vehicles used by many states, as it is not essential to their economical operation. There will undoubtedly be a revision of the order to aid highway departments. North Carolina reported that it has 3,500 units of equipment operating on 60,000 miles of roads. Much of this equipment is motor vehicles used for pulling road drags, mowers and snow plows, quite distinct from commercial haulage.

West Virginia reported that it will cost about $4,500 per month for labor alone to meet the requirements of ODT Order 21 for its 30,170 trucks, while tire inspection will cost some $65,000 per year. It is the plan of the West Virginia State Roads Commission to reduce the use of gas by state-owned vehicles by requiring a definite reduction in the use in each district.

Virginia reported that 450 of its trucks have no speedometers so that it is difficult to conform with requests for some of the data. It has a total of over 2,500 pieces of rubber-tired equipment which would require an equal number of separate reports each month under ODT Order No. 21. Since December 7, 1941, the Department has reduced its gas consumption 31 per cent and believes it can save 10 per cent more. It was suggested that the State Highway Department district shops be made ODT inspection points for state equipment.

Missouri has reduced the mileage of state highway equipment 52 per cent in the first ten months of 1942, as compared with the same months in 1941. Retreads have not been found to give good service in heavy-duty work.

H. R. Stickle, Executive Assistant to John L. Rodgers, Director, Division of Motor Transport, Office of Defense Transportation, Washington, D. C., called attention to the fact that the first attempt to conserve gasoline and tires was through voluntary means. This worked for a while but it soon lost ground which led to ODT Order No. 21. Time is the most important element in the conservation program, as rubber is becoming increasingly critical. When ODT first issued Order No. 21, it was not possible to confer with all groups effected, which led to some misunderstandings.

ODT has nothing to do with the inspection of tires, Mr. Stickle pointed out, that being the responsibility of OPA, to which states should apply to have members of their own organization appointed as inspectors.

C. & E. M. Photo
A double 15 x 15 reinforced-concrete culvert on a new Arizona highway.

Big Culvert Used To Handle Traffic

Highway construction in mountainous country provides a traffic problem not easy to crack. There is seldom an alternate route; add important mining operations with its motor traffic running up to 2,000 vehicles a day and the problem grows immeasurably. Just such a situation occurred in late 1941 in the mountains of Arizona where the State Highway Department awarded three contracts for the improvement of three distinct sections of the strategic network to serve the rapidly expanding mining industry between Superior, Miami and Globe.

Topsy-turvy construction might describe the handling of one section, but it was all part of the plan and kept water and traffic separated even though each used the way provided for the other for a period. A double 15 x 15-foot reinforced-concrete culvert was built right on top of the old bituminous road with traffic going around it on a shoo-fly fill during construction. All this time the stream, which was to flow through the culvert, was 30 feet below.

As the fill began to be placed over the old road adjacent to the culvert and across the stream bed, traffic was routed through the culvert. Finally, when the fill cut off the stream entirely and wasted material filled the stream bed, raising it to the elevation of the old road, traffic was moved up onto the new fill and the culvert left to its proper duties.

The End of an Era And Post-War Plans

With the entry of the United States into World War II there came to an end a historic era of highway development. During the years between 1918 and 1942 the motor vehicle grew to be our most important means of transportation. And the construction of roads and bridges to carry those vehicles became one of the country's primary objectives.

At no time during this period has the availability of public funds for highways been able to keep pace with the demands. But in spite of the fact that highway development of necessity has had to lag behind the increasing use of motor vehicles, we have created in this country a highway system that is the greatest in the world.

Now all new construction has been stopped for the duration. The materials and the money are needed urgently elsewhere. Unessential driving is being eliminated because of gasoline transportation problems and an acute rubber shortage. There are some people who contend that since our highways often are inadequate for possible military traffic we should reconstruct them immediately in the interests of national security. However, it is impossible to build a highway system today for the needs of today. Regardless of deficiencies, our highways must stand or fall in the present emergency on the basis of what already has been accomplished.

Regardless of deficiencies we believe that our highways will stand the test. Yet there is a lesson to be read that can be advantageous to us when the war is won.

As highway development progressed during the past quarter-century, there has been growing slowly a realization that the only sound policy is to build for the future. True, the pressing needs always have been present ones. But a consideration only of the present creates the greater weakness of the future.

In Vermont the State Highway Board is fully aware of the vital necessity for maintaining existing facilities during the war period. Everything possible will be done to protect the public investment and keep the highways open for essential traffic. But the future offers a great challenge. And in this transition between the era just ended and the new era that will come with peace, the Board is looking ahead and planning for Vermont's highways of tomorrow.

Consideration should be given now to maintaining the present facilities if the public investment is to be protected, if post-war repairs are to be held to a minimum, and if the highways are to be kept open for essential transportation. However, a drastic reduction in all maintenance items must be faced, and a considerable change in both the appearance and condition of our highways must be expected. Winter maintenance, the cost of which to the State of Vermont on all highway systems amounted to $1,329,082.60 during the past biennial period, should be curtailed as much as possible without unduly interfering with really necessary travel. But maintenance of the roads and bridges themselves, even though it must be reduced to dangerously low limits, should have a priority on available highway funds.

Consideration also should be given to the problems of the future. The post-war period will see a tremendous expansion in the country's transportation facilities. The transition from a war to a peacetime economy will demand a full program of public works to prevent disastrous unemployment. In Vermont the ten-year program of needed highway improvements established in 1941 provides a completed and flexible plan for future developments. A selection of projects based upon this program should be made ready for immediate construction when the funds become available.

From pages 7, 23 and 24 of the Eleventh Biennial report, State Highway Board of Vermont, for the Fiscal Years 1941-1942.

Anti-Diversion Votes Piled Up Huge Odds

The election returns from Iowa, Oregon and West Virginia, which showed the voters of all three states overwhelmingly in favor of the anti-diversion amendments, give renewed hope that in other states now considering such amendments more favorable action will be taken in the next few years. The returns from Iowa showed a ratio of about 8 to 1 favorable to the amendment. West Virginia's "Good Roads Amendment" went through with a majority of nearly 6 to 1, while in Oregon the ratio was only 1½ to 1.

Post-election reports from all three of the states indicate that tire rationing and other wartime restrictions, which in recent months reduced gasoline consumption in three states from 16 to 35 per cent below the same months a year ago, were important factors in the size of the vote cast in favor of this method of protecting road revenues.

Two other factors also are credited with piling up a record majority for these amendments. In each of the three states, large bond issues were outstanding and some provision to insure payment of highway bond service as well as maintenance during the war without increasing taxes was essential. Forty-one out of the forty-eight states have highway bonds outstanding today and the principal and interest payments on these bonds must be met from declining gasoline taxes and registration fees. The second factor was the desire in each state to protect road funds against dissipation in order to insure their availability for highway construction projects as a cushion against post-war unemployment.

The wisest policy for highway departments, both state and county, today, is to build up highway fund surpluses wherever possible during the war period, and in the case of states, to protect those surpluses through the enactment of a constitutional amendment so that the money will be available to meet needed highway improvement projects when the war is won. By following this course, it will be possible to give returning service men and war workers the jobs they will need when the war is over. This will do much to cushion and perhaps prevent a post-war depression, for highway construction projects can absorb more workers per dollar expended than any other form of constructive enterprise.

Wood-and-Glue Arches

Tons of steel were saved recently for war purposes in the construction of the U. S. Housing Administration Recreation Center at Bremerton, Wash., by the use of wood-and-glue laminated arches. The six arches stretch 71 feet from foot to foot and each weighs only two tons.

In constructing these arches the fabricators used 26,000 board feet of dimension lumber, 1,590 pounds of Laucks casein glue made by I. F. Laucks, Inc., Seattle, Wash., and ten gallons of Rez, a synthetic resin sealer. The arches were constructed in Seattle and were transported by logging truck to the site. They were built in two sections and were joined together at the center.

Heil Personnel Changes

Two important changes in plant personnel have recently been announced by the Heil Co., Milwaukee, Wis. Herman C. Frentzel, Chief Engineer, has been appointed Works Manager, and Charles G. Eisenberg has been promoted from Chief Engineer of the Body and Hoist Division to Chief Inspector.

Mr. Frentzel has been with Heil for 12 years, holding the position of Chief Engineer since 1938. Mr. Eisenberg has had 24 years with Heil, having started as a blueprint boy in 1918.

SAFE WAYS IN WAR PRODUCTION

NEW WORKER—Every new employee in a Bethlehem Plant wears this button. It helps to fix his attention on safety. It signals to more experienced employees that he is new to the plant, and they keep an eye on him, and do not hesitate to offer friendly guidance in case he forgets instructions and unknowingly breaks any safety regulation.

Industrial accidents, bad enough because of the human distress they cause, are also a grievous drag on production. Every day that injury lays up a worker means lowered output of the materials our armed forces are asking for.

Safety engineers know they must be more than ever on guard as pressure for production intensifies and men work against time. When war came, Bethlehem Steel Company expanded its accident-prevention program to meet the new conditions. Special efforts were addressed to the new employee to make him safety-conscious from the moment he walked into the plant. And by posters, group meetings and individual instruction, the safe way of doing his job was ground into the subconscious of new Bethlehem employee and veteran alike.

Significant are the results of a current study, showing that of all disabling accidents to Bethlehem employees less than one-third occur in the course of their work. Even with employment rolls upped by the tens of thousands and plant operations at top speed to meet the demands of the war program, the Bethlehem employee is safest, best protected against injury, during the hours he spends on the job.

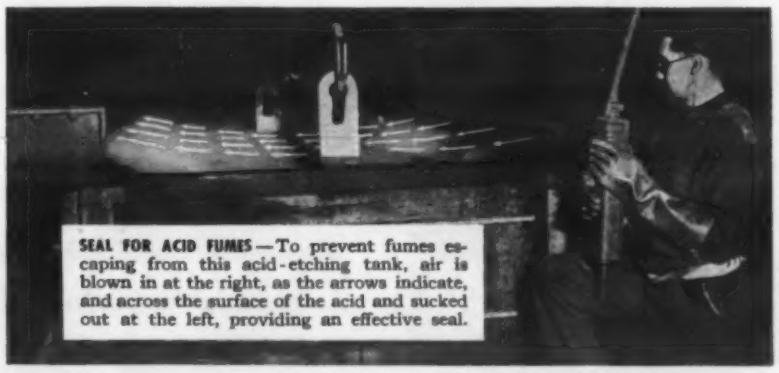
AUTOMATIC HAND GUARD—This man is operating a trimming press. If he should absent-mindedly let his hands move too near the danger zone, the two cables will automatically whisk them back to safety, before the ram of the press descends.

100% HEAT-INSULATED—Asbestos-covered hood, chrome-leather full-length apron, chrome-leather gloves, chrome-leather full-length sleeves and asbestos guard on torch handle give this worker complete protection against heat and flying sparks.

EYES DOUBLY GUARDED—Even though this grinder is equipped with a heavy glass shield, the eyes of the man who is operating it are given further protection against sparks or flying bits of abrasive by the cup goggles that he is wearing.

BETHLEHEM STEEL

Bethlehem Steel Company is actively supporting the National Safety Council in its campaign against accidents in war production, through the War Production Fund to Conserve Manpower.



SEAL FOR ACID FUMES—To prevent fumes escaping from this acid-etching tank, air is blown in at the right, as the arrows indicate, and across the surface of the acid and sucked out at the left, providing an effective seal.

Wage and Hour Laws On Public Works Jobs

(*Continued from page 17*)

terstate transportation of liquids and gas; dams, the effect of which is to enhance and improve navigable waters as instrumentalities of commerce; wharves and docks which directly facilitate the movement of goods in interstate commerce; airports and airfields. This list is not all-inclusive; the items mentioned are those most apt to be of interest to readers of this magazine. Similarly, the maintenance, reconstruction, and repair of buildings used to produce goods for interstate commerce are covered.

Readers naturally will ask, what is the dividing line between original construction of essential instrumentalities of commerce or of buildings used to produce goods for interstate commerce and their maintenance, repair or reconstruction? Due to the wide diversity of such operations, no hard and fast formula can be laid down. But it may be said that the newly merged Wage and Hour and Public Contracts Divisions' enforcement procedure will be based upon a commonsense practical application of these terms.

For example, where employees are engaged in the construction of runways for a new airport, the Division is not presently prepared to take a position regarding their coverage under the Fair Labor Standards Act. But employees of a contractor subsequently engaged in repairing or resurfacing these runways would be covered in the opinion of the Division.

Public Works Construction

The present heavy preponderance of Government construction makes it advisable to point out that neither the Wage and Hour Law nor the Walsh-Healey Act applies to employees of the United States Government or to employees of any state or political subdivisions thereof. For example, neither Act covers employees of state or county highway departments. But employees of contractors doing certain kinds of work for such agencies will be covered.

Touching more specifically on war construction, it should be said that coverage under the Wage and Hour Law depends on the nature of the work which the contractor's employees perform rather than on the agency which lets the contract. Thus contracts with the War or Navy Departments, the Defense Plant Corp., the Bureau of Reclamation, and other agencies, for the original construction of bases, ordnance depots, arsenals, training camps and similar installations would not be covered.

As already stated, the Division takes no position regarding the coverage of employees engaged in the original construction of essential instrumentalities of commerce such as airports and, for example, those portions of Navy yards (dry docks, graving docks, and similar structures) which may be used to produce goods for interstate commerce. But the Division considers that contractor's employees engaged in the maintenance, repair or reconstruction of such essential instrumentalities of commerce will be covered by the Wage and Hour Law, whether such work is performed for public or private agencies. In the case of defense plants, the same principles will apply. Their original construction will be exempt; subsequent maintenance, repair or reconstruction will be covered if the plants are engaged in the production of goods for interstate commerce.

Employers are reminded that the exemption mentioned above would not extend to employees engaged in moving, ordering, or receiving goods or materials across state lines nor would it include employees in the central office of a concern having contracts in another state.

The same situation obtains in other fields which involve original construction work and subsequent maintenance or repair of essential instrumentalities of interstate commerce. The Division believes that contractors and engineering firms can "draw the line" on most jobs which they undertake. Those who are in doubt about a particular operation should consult the nearest regional or field office of the Wage and Hour and Public Contracts Divisions.

While the Division has not taken a position regarding coverage where employees engage in the original construction of highways and similar public works, contractors who wish to be "on the safe side" are advised to meet Wage-Hour Standards for employees who are so engaged.

Equipment Dealers' Status

Distributors of construction equipment who are independent representatives of manufacturers will be covered by the Wage and Hour Law if any of their business (buying or selling) is conducted across state lines. This coverage also will apply to employees in the service and repair departments of such firms during any weeks they engage in servicing equipment that is used on jobs which are subject to the Wage and Hour Law, i.e. the type of maintenance, repair and reconstruction already cited.

These service employees also will be covered if they service or repair equipment sold to a purchaser in another state under a contract which calls for the servicing of such equipment by the distributor, even though the equipment is not used on covered work.

(*Continued on next page*)

Wage Law Coverage Depends on Work Done

(*Continued from preceding page*)

Where a distributor's employees assemble and install equipment (such as concrete batching plants) they will be exempt if the work is part of an original construction job. They will be covered if the installation is a reconstruction or replacement job.

Work Done Determines Status

Employers should remember that it is the work a particular employee performs which determines whether or not he is covered by the Wage and Hour Law. And since this Act takes the work-week as its standard, it frequently happens that employees during some weeks perform work which is covered by the Act and during other weeks may engage in work that is outside the scope of the Act.

In case an employee performs both kinds of work in a single work-week, he is entitled to at least the minimum hourly wage for the entire week, and to time and one-half his regular rate of pay for all hours worked beyond 40 during that week.

Exceptions

In its year-long study of fair labor standards, Congress recognized that the duties of certain employees do not lend themselves to wage-hour regulation. Consequently, Section 13 (a) (1) of the Act exempts from both the minimum wage and overtime provisions any person employed in an "executive, administrative, or professional capacity," as these terms are defined and delimited by the Administrator in Title 29, Chapter V, Code of Federal Regulations, Part 541.*

Among other requirements for exemption as an executive, the employee must receive a salary of at least $30 a week and his duties must be fully in line with the official definition. The salary test for an administrative employee is $200 monthly and the nature of his work must coincide with the official description. Except in the case of qualified lawyers and physicians, for whom there is no salary requirement, professional employees also must receive at least $200 in salary or fees. Some engineers will come within this exemption if their work and qualifications are in accord with the regulations.

Questions have arisen concerning the status of employees engaged in producing materials such as sand, gravel, asphalt and concrete for use solely within the same state in the construction, maintenance, repair or reconstruction of essential instrumentalities of interstate commerce. It is the present position of the Wage and Hour Division that such employees are not subject to the Wage and Hour Law merely by reason of the use to which such products are put. Take the typical case of an employer who has contracted to repair a highway and has leased a gravel pit near the job location. His employees in the pit do nothing but dig gravel for use within the state in re-

(*Concluded on page 48*)

*Copies of these regulations and other informative material mentioned in this article (including Rulings and Interpretations, which pertain to the Walsh-Healey Public Contracts Act) are available without cost at all field offices of the Wage and Hour and Public Contracts Divisions and the National Office, Desk MSS, 165 West 46th Street, New York, N. Y.

Pointers in Care Of Conveyer Belts

(*Continued from page 40*)

shock directly at the point of impact.

The speed of a conveyor belt should be adjusted to the point where the belt carries a maximum, uniformly distributed load. Thus wear will be equally distributed across the greatest possible width of the belt and, since any point in the belt will pass the loading point a minimum number of times during its life, the optimum service will be produced. Mechanical feeding equipment and a well-designed surge-bin arrangement are the best means of accomplishing the desired uniform feed.

Care should be taken in the selection of pulley sizes, since the radii through which belts must pass have a great effect on the length of their life—small pulleys being detrimental to the flexing life of the carcass. On installations where belt traction becomes a problem, this factor can be increased approximately 40 per cent by lagging the drive pulley. Special 2 to 4-ply lagging material with a rubber cover on one side is available, but often a satisfactory lagging can be cut from a belt which has been retired from service. In either case, the material should be fastened to the pulley with special flat-headed bolts and should be examined regularly for replacement when worn.

Lumps or quantities of moist, sticky material should be prevented from accumulating on the pulley side of the return belts where they may inflict severe damage in passing around the pulleys. This can be accomplished by a system of decking built over the return half of the belt at points where spillage may occur, or by well-placed brushes or scrapers to remove the material before it reaches the tail pulley. Special rubber-covered brush rolls have been developed for this purpose.

Avoid, however, the excessive use of such scrapers and also any skirt boards or side guide rollers which may seem necessary. All these add to the abrasive wear the belt must undergo, and particularly in the case of skirt boards and side rollers attack the belt at its vulnerable edge where the carcass can easily be laid open to the attack of moisture and rot.

Better than side guide rollers are self-aligning idlers which can be used in unusual circumstances. Ordinarily, where conveyors are installed with all pulleys and idlers square to the center line, a belt of the proper flexibility for perfect troughing is used, and when material is loaded evenly onto the belt, it will train perfectly without external control devices.

The spacing of idlers is important and should be arranged so that the belt receives ample support. A belt which is allowed to sag unduly will suffer severe damage from the impact of lumps at the point where it lifts over the idlers.

Take-up devices should be carefully engineered and applied at the point where the slack occurs in the belt, usually directly after the drive. In small installations—particularly inclined belts—screw-type take-ups at the tail pulleys are generally satisfactory. A large or long conveyor should be equipped with a counterweight type take-up, which will permit the belt to adjust itself automatically to changes in length between empty and full load tensions, and where slack strain is maintained constantly at the desired slack tension. With either type, just enough tension should be maintained to provide necessary driving and this should be checked periodically.

Conveyor belts should be inspected regularly for damage to the cover and even the most minor cuts should be repaired promptly. Moisture, acids, and fine materials gaining entrance to the carcass at even the smallest puncture frequently cause serious unseen damage. Self-vulcanizing cement and plastic rubber compounds are available for making entirely serviceable repairs. In the use of this material, the edges of the cover are trimmed back far enough to remove any loose rubber, surfaces are cleaned and roughened, two coats of cement are added, and the plastic rubber is applied and rolled tightly into place.

More permanent repair jobs can be effected by the use of small portable electric vulcanizers, and in some cases even new patches of fabric can be cured into place at damaged spots by experienced workers. For more detailed recommendations you should consult your belt sales engineer.

Inspect all idlers regularly to be sure that they turn freely. A frozen or hard-running idler can cause severe belt wear, and can make belts run out of line and fail to carry their loads properly.

Idler lubrication should be performed only under a strict schedule and with the greatest care. Besides causing damage to anti-friction bearings themselves, too much grease will overflow any type of bearing, come in contact with belt covers and cause serious injury. If the belt operates in a place where there is a high temperature or direct sunlight, this action is greatly accelerated.

Belt fasteners should be watched carefully. Loose, broken, or badly worn fasteners should be replaced immediately and they should all be kept well tightened. A loose or broken fastener can tear a belt for its entire length. Where circumstance warrants the expense in-

(*Concluded on next page*)

tending the Life Of Rubber Beltings

(*Continued from preceding page*)

ed, ply-stepped splices and field anized covers are an ideal means of ing belt joints. However, the right and type of belt fastener will prove lly satisfactory.

onveyors should be covered, or com-ely housed if possible, for protection nst weather of all sorts, particularly ight, which is extremely hard on ber. However, housing should be that belts and idlers are always ssible for inspection and repair.

Elevator Belts

levator belt installation calls for the e precautions as for conveyor belts. 't let sharp bends or twists occur, cially when the belt is under tension. ure the belt is adequately supported ll points.

o a particularly careful job of plan-g for the attachment of buckets. rmine their spacing in advance and ure to take into account the lengths elt required on each side of the splice establish equal bucket spacing for load distribution. Determine the per size for the bolt holes and then e an accurate template to mark the tion of the holes for punching. f the material to be handled carries appreciable amount of moisture, such wet sand or gravel, it is a good pre-tion to cement the inside surfaces of holes for protection against entrance noisture and rot. For attaching the kets, be sure to use the correct type of flatheaded elevator bucket bolts.

Most of the procedures listed under conveyor belts are applicable also in the care of elevator belts. In addition, see that adequate ventilation is provided for a closed elevator handling hot materials. Inspect the back surfaces of the belt carefully to be sure that material is not dropping down between the belt and the boot pulley and destroying the belt from the back. The best solution to this problem is the special slat type pulley.

To insure long life to an elevator belt, provide the driving motor with an overload indicating mechanism to sound an alarm for the operator, or to shut down the elevator completely and automatically, in the event a surge of material jams the boot.

Acknowledgment

This article is based on material furnished through the courtesy of T. A. Bennett, Manager, Belting Sales Engineering Department, United States Rubber Co., New York City.

Handling Materials

The complete line of handling machinery for coal, ore, crushed stone and gravel made by Robins Conveying Belt Co., Passaic, N. J., is described in a new 24-page illustrated bulletin No. 121E. This bulletin covers bridges using the rope system or man-trolley system, towers, special rigs for unusual problems, grab buckets, car dumpers, car and barge hauls, rail clamps and cable-railways.

Copies of this bulletin will be furnished free on request to readers of CONTRACTORS AND ENGINEERS MONTHLY who write direct to Robins and mention this item.

A Guide For Form Ties

A new booklet recently published by the Richmond Screw Anchor Co., Inc., 816 Liberty Avenue, Brooklyn, N.Y., contains information on over 106 different types of form-tying devices and accessories. It is filled with tables, charts, graphs and cost facts which have not been published before, and, all in all, is a valuable working tool for everyone connected with concrete work.

Copies of this Form-Ty Engineering Guide are available without cost by writing direct to Richmond Screw Anchor Co. and mentioning this review.

Wage and Hour Law

(*Continued from page* 45)

pairing the highway. Since such operations are of a local nature and are distinct from the actual work of repair or maintenance, these employees will not be covered *unless* they also engage in road repairing activities, such as hauling materials to the site of the work or spreading materials on the road bed or rolling the surface.

The Walsh-Healey Act

Though it is not likely, some readers of CONTRACTORS AND ENGINEERS MONTHLY may find that a part of their operations are subject to the Walsh-Healey Public Contracts Act. This law applies generally to U. S. Government contracts for materials and supplies in excess of $10,000. However, the Act does *not* apply to contracts for the construction of public works, including buildings, bridges, highways, airports and ships other than U. S. Naval vessels.

The Walsh-Healey Act sets standards of maximum hours, overtime compensation, child labor, and safety and health and forbids the employment of convict labor in the performance of contracts subject to the Act. This law does not apply to contracts awarded by a state or political subdivision thereof, such as county or municipal governments.

Maximum straight-time hours under the Walsh-Healey Act are 8 in any one day or 40 in any one week. Overtime is permitted, of course, if time and one-half the basic wage rate is paid for hours worked beyond these limits.

The minimum wages under the Walsh-Healey Act are those which the Secretary of Labor has determined to be the prevailing minimum wage for specific industries and localities. These rates may be higher than those provided in the Fair Labor Standards Act.

The agencies charged with enforcing the Wage and Hour Law and the Walsh-Healey Act had cooperated closely in the past. Recently they were merged under an order of the Secretary of Labor. Now called the Wage and Hour and Public Contracts Divisions, the combined agencies are directed by L. Metcalfe Walling, Wage-Hour Administrator, who was also the first and only Administrator of the Public Contracts Division.

The consolidation will effect substantial savings of time and money, will facilitate the work of administration and enforcement and spare employers the necessity of dealing with two inspectors. Field offices of the Wage and Hour Division, strategically located from coast to coast, now serve the combined staffs.

Keeping Records

Employers who are subject to either of these Acts must keep certain time and payroll records. No special forms or accounting methods are required, but records should include: Employee's name, address, occupation (and age in the case of minors); time of day and day of the week on which employee's work-week begins; regular hourly rate of pay; hours worked each work-day and total hours worked each work-week; total deductions from or additions to employee's pay; total daily or weekly straight-time earnings; total weekly overtime excess earnings, that is, the amount paid solely as overtime, above all straight-time earnings; total wages paid each pay period and the pay period covered by each payment.

Enforcement

"Enforcement policy has stressed the importance of securing compliance through voluntary action," Administrator Walling said recently, "but both Acts have 'teeth' in them. Penalties under the Wage and Hour Law include for wilful violators a fine up to $10,000, and, in the case of a second offense, imprisonment up to six months, a fine, or both. Disabilities that may result from failure to comply with the Walsh-Healey Act involve cancellation of the contract, and, where flagrant violation is found, employers can be blacklisted from Federal contracts for a three-year period.

"Full compliance is not only good insurance, it is good business as well," Mr. Walling added. "Nowadays employers are pretty well agreed that decent labor standards contribute to industrial stability and place the competitive emphasis where it belongs—on better production methods and machines."

Regular Maintenance On Connecticut Roads

(*Continued from page* 33)

the road more than ten minutes before being covered.

Sealing Operations

Screened sand is used for the sealing, being loaded at state-owned pits direct from the banks by belt loaders equipped with screens hung on the delivery end. These screens are made of steel bars welded to give a mesh of ½ to ¾-inch, and are shaken frequently to clear them of roots and other debris which gather on them. A fleet of five to eight 4-yard Mack and Brockway dump trucks, depending on the lengths of haul, is used in District 8 to haul from the nearest sand pit to the site of sealing operations. The truck drives over the sander belt conveyor which is quickly hooked into position front and back, the truck body is raised slightly to start the flow of sand and all is ready for the actual sanding operation. The two men in the empty corners of the truck shovel the sand down toward the opening in the tail-gate. As soon as the hopper is filled, the belt man riding the conveyor at the rear, standing on a safety platform, blows his whistle and the truck starts simultaneously with the belt, the operation of which is controlled by the man who operates the throttle and clutch at the front of the sander. Thus four men are all that is required to operate the sander, assisted by the truck driver who is delivering the load.

Immediately following the application of the sand, two trucks start out with broom or blade drags to spread and mix the sand and tar. The broom drags are composed of five rows of five steel brooms each and are dragged behind the trucks by long chains at a slight angle. They are run over the surface repeatedly until it shows a uniform coating of the sand with the tar and a uniform spread of the coated sand over the road surface. The surface is not rolled but is quickly consolidated by traffic.

At intersections where there are flaring corners the tar is applied by hand, using buckets or hand hose and a squeegee to spread it uniformly over the surface. The sanding following this is done mostly by the mechanical sander, with some spotting by hand direct from the truck body.

Personnel Organization

The organization required for this work consists of two men with the loader at the sand pit, five to eight trucks and drivers for hauling the sand, four men for the sander, two trucks and drivers for the drags and two laborers, all in charge of the District Maintenance Foreman.

Maintenance operations in District 8 are in charge of a Maintenance Supervisor, with fifteen maintenance foremen. A. L. Donnelly is Director of Roadway Maintenance, Connecticut State Highway Department.

Our series of articles on the care of equipment and parts offers you many helpful hints in solving the problem of keeping your machines on the job. Remember—proper maintenance and regular lubrication will keep your construction and highway maintenance equipment working longer and more effectively for Victory!

The new Lincontrol for arc welding.

New Foot Controls Speed Arc Welding

A new type of arc welding control, which enables the welder to speed up his work and do a more accurate job, has been announced by The Lincoln Electric Co., Cleveland, Ohio. This control, the Lincontrol, weighs but little more than a shoe and is strapped onto the welder's foot, enabling him to move about with it freely. It was originally intended for aircraft welding, but is applicable for all kinds of light-gauge sheet metal work.

With the control strapped to his foot, the welding operater merely presses down on the pedal which moves the pin to operate a current control. As he increases the pressure the current is increased. This permits very accurate control over the welding arc and combines in one unit the results of the so-called "hot-start" and "crater eliminator."

This control eliminates the necessity of making adjustments on the welding machine, due to such things as minor changes in thickness, and changes in fit-up and enables the operator to weld in any position which he finds convenient or comfortable. The Lincontrol is sold separately from the welding machine and the manufacturer reports that the controls can be delivered in a short time. Complete information and cost may be secured by writing direct to the manufacturer and mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Plastic Spray-Gun Bodies

A new black plastic spray-gun body, weighing ¼ pound less than a spray gun with an aluminum body which it replaces, has been announced by the Eclipse Air Brush Co., Inc., 400 Park Ave., Newark, N.J., after many months of development and testing. The manufacturer reports that the plastic has good chemical resistance and is not effected by thinners, solvents, paint removers, etc., is strong, has good impact strength and its smooth black surface makes it easy to clean.

These guns have been on the job for several months in places where equipment of this type is in constant use, such as shipyards, aircraft factories, munition plants, etc., and reports are favorable. Priority assistance is still required to obtain the guns, but the manufacturer reports that delivery is good.

Complete information, including prices, may be secured direct from the manufacturer by mentioning this item.

Highway Activities In Maricopa County

(*Continued from page 21*)

been resurfaced with the oil mat and at the same time widened to accommodate modern traffic.

Shops and Equipment

The county maintains all of its own equipment in a group of shops erected on a former hospital site which became untenable for that purpose because of the growth of the largest private independent meat-packing house in the country nearby. The main garage is 100 x 200 feet and was originally L-shaped but has been straightened out for convenience. All repair work is done in the main garage but there is also a welding shop measuring 115 x 50 feet where the blacksmith is located and also the complete welding equipment. This includes a Lincoln electric welder and a Hobart electric welder, as well as an acetylene outfit. In the shop are also a Manley hydraulic press, a large drill press, a trip hammer, a double grinder, a lathe with an 8-foot bed and two smaller lathes, a second drill press, a 120-ton hydraulic press and a good stock of tool steel and mild steel. The reason for the number of pieces of heavy equipment is that the county took advantage of the sale of the machinery from the repair shop of an abandoned mine.

A traveling grease man takes care of all the lubrication of equipment in the field. He has a ½-ton pick-up truck with a complete set of Alemite grease guns. Each district of the county has its own pavement and bridge repair crews but all work out of the same central yard. When jobs are too big for one crew they are consolidated.

In the yard is a Kerrick Kleaner for removing grease and dirt from equipment to be repaired or overhauled, and three 1,000-gallon fuel tanks, one each for diesel fuel, standard gasoline and "blue" gas for non-highway use. This is a state law, the character of the dye being to show that no tax has been paid on that gasoline. The county used a total of 250,000 gallons of gasoline and diesel fuel last year.

Organization and Budget

The entire county government is administered by three supervisors who are elected from the three supervisor districts all at one time for a period of two years. They appoint the County Engineer for a period of two years.

The finances for the County Highway Department are secured entirely from the 5-cent state gas tax, three-tenths of which is refunded to the counties according to the amount of gasoline sold in the county. Maricopa County, it may well be realized, gets about 39 per cent of the total county refunds. For the fiscal year ending June 30, 1942, the county highway fund was $635,214.87. Of this the supervisors took $90,000 toward the amortization of the $8,000,000 bond issue of 1921 for the construction of 300 miles of concrete roads.

Maintenance

Because of the extensive mileage of county roads there is no attempt at mowing the roadsides. Some farmers occasionally mow the sections of shoulder along their properties as it keeps the trash seed down and protects their fields. The county usually resorts to burning the weeds in October after the frost has killed the tops.

An interesting case of "haste makes waste" occurred last winter when the county hurried the construction of a section of road in order to serve a military establishment. Two miles of the oil-mat construction were completed with SC-2, using four power graders working for a week to mix the aggregate and asphalt. The presence of moisture that could not be aerated and removed from the mix prevented the asphalt from adhering to the aggregate, leaving considerable free oil in the mat. As soon as warm weather came in the spring the road started to bleed. All that was necessary was to take up the oil mat, remix by blading until all moisture was removed, and then it was laid down and is as good as any of the other roads of this type. If there had not been the rush due to the request of the Army for the completion of this access road, the material would have been windrowed and not spread, but left in the windrow for the winter and worked in April when the weather turned warm.

Personnel

This article is the result of an interview granted by Julius Irion, County Engineer for Maricopa County, Arizona.

LeTourneau Employees Receive Army-Navy "E"

Before an estimated crowd of 3,800 people, the Peoria plant of R. G. LeTourneau was awarded the Army-Navy "E" on January 6 for the remarkable production achievements of LeTourneau workers.

Col. Claude H. Chorpening, Corps of Engineers, U.S.A., who presented the Award, said that Army engineers are first into the fighting zones and the last to leave, and LeTourneau equipment goes with them. Lt. C. T. Walter, Navy Consultant to WPB in the Peoria region, presented the "E" pins to representative employees.

Seeding Operations On Road Job in Ohio

(*Continued from page* 19)

moval during construction, but both the highway engineer and the contractor felt that it might be saved if several changes were made in adjacent walks and drives. As a result, a private drive was removed, the surface area of the root system covered with 14 cubic yards of aggregate, obtained from the topsoil screening, and then a 4-foot fill placed as necessary. A large collar of aggregate was brought up around the trunk of the tree to the finished grade. After the fill was compacted, the sidewalks were poured in such a manner that they encircled the tree. Several of the limbs were then removed, and thus a fine large tree was saved by the foresight of two men.

In other cases on the project, the alignment of the sidewalk was changed in order to protect further the roots of certain trees marked for preservation. Such changes were made voluntarily by the contractor, even though additional labor was involved.

Seeding and Mulching

The next major operation was the seeding and mulching upon the 3 inches of topsoil. The seed was worked onto all the flat areas by harrows attached to a Silver King tractor. On certain slopes where the tractor could run along the top, the harrow was pulled back and forth across the slope by lengthening the cable attached to the drag each time a trip was made. On some of the steeper slopes, a man with a Cyclone seeder rode on the harrow, seeding the soil as it was loosened. A second harrowing worked the seed into the soil.

Some of the large cut slopes on the project have no place for equipment to work along the top. As it would have been a slow and expensive operation for men to carry the straw for mulching up slopes which were 70 feet in height and from 130 to 150 feet long, the contractor devised a method whereby the Silver King tractor with two angle irons attached on the front could haul two, four or six bales of straw to the top of the slope. Since all of these slopes had concrete intercepting ditches, the tractor merely straddled the ditch with its wheels and followed the ditch to the top, dropping off the bales of straw to the men who were spreading it on the slopes.

It is estimated that this operation saved as much as 14 cents per bale in labor costs for handling the straw. On cut slopes 10 to 20 feet in height, which also have the concrete ditches on the top, the straw bales were handled by hooking ten or fifteen bales to the back of the tractor and dragging them along the ditch to the points of distribution. In this case, the contractor used a strong rope with fifteen hooks attached to it and a bale of straw was attached to each hook. The estimated labor-saving cost on this straw-handling operation was 6 cents a bale.

The contractor used a long fire hose to wet the straw on two particularly steep slopes, as the use of water is one of the best methods of compacting straw to prevent its blowing away. This could be done easily as fire hydrants were available every 800 feet along the project. The mulch was wet in addition to tying it down because the slopes were in a very windy location and the contractor felt that just tying the mulch would not be sufficient to keep it in place. The benefit to the state as a re-

(*Concluded on next page*)

Outstanding Work On Roadside Project

(*Continued from preceding page*)

sult of this operation was the early germination of the seed on these two slopes and a coverage which would not have been possible otherwise, due to the dry weather and the lateness of the season.

Another example of the contractor's cooperation with the project engineer was the separating of large mulched areas by means of an 18-inch bare swath. This was done to prevent a serious loss and damage by fire on certain areas along the project which were subject to discarded cigarettes and matches. After a rain or two which eliminated the fire hazard, the contractor went back and mulched the bare strips.

Subcontract for Sodding

Although the sodding on the project was sublet by the contractor, the quality of the sodding matched the high character of the work done by the Middle West Roads Co. Joseph H. Kroeger of the Kroeger Sod Co., Cincinnati, Ohio, who contracted for this work, has performed many other large sodding projects at low cost, due to his invention of a sod-cutting machine and a power-driven sod roller. The sod cutting machine, which is now manufactured by the Gledhill Road Machinery Co., is capable of cutting 350 square yards of sod an hour in any thickness from ½ to 3 inches. The strips of sod are usually cut 12 and 24 inches in width.

Sod delivered to the project cost 8 cents per square yard, which is a saving of 2 to 3 cents per square yard over the lowest possible price furnished by sod men using hand cutting. Not only is money saved by the use of the sod cutter, but it assures a uniform thickness of sod as well as fast delivery and the minimum exposure to adverse climatic conditions. Sodding on this project was chiefly on the flat areas in the residential sections, although the contractor used a few square yards of sod at his expense to protect certain extensive drainage structures. The sodding on these structures was done immediately upon completion and not at the time when the majority of the sodding was performed.

The power-driven sod roller which was used on all sod located on flat areas and slopes was also designed by Mr. Kroeger but will not be put on the market until it has been tested further. It has water-filled rollers 30 inches in width and may be adjusted to variable weights from 500 to 1,400 pounds. It is possible to roll 900 square yards an hour to a very uniform surface grade, and the use of this roller therefore permits much more extensive sodding because of the much lower unit cost.

History of Contractor

The Middle West Roads Co., contractor for this project and winner of our 1941-1942 National Roadside Development Award for the greatest contribution made by a contractor to roadside development in the United States during the years 1941 and 1942, was organized in 1930 as a subsidiary of Warren Bros. Co. It does business throughout the middle west and south, with its head office in Indianapolis and another office at Noblesville, Ind. Its President, D. A. Hathaway, has been associated with the company since the 1930's, became Vice President in 1937, and President in 1942. Wendell O. Eldridge is Vice President, and the company's General Superintendent is Eugene Berkey, formerly a District Engineer for the State Highway Commission of Indiana, who has been with the Middle West Roads Co. for about ten years.

Up to 1941, the company did about $1,000,000 of construction annually. During 1942, they did in excess of $3,000,000 of work. They have handled a number of difficult road jobs in Johnson, Lawrence and Jefferson Counties, Kentucky, and recently completed the paving and all construction at Camp Breckenridge, Kentucky. They have also recently constructed two large airfields in the south, and are now engaged in two other large airfield projects.

Personnel

For this Ohio highway project, Eugene Berkey was Superintendent for the Middle West Roads Co., and C. Kleemeier was Project Engineer for the Ohio Department of Highways.

The Middle West Roads Co. was nominated for one of the 1941-42 Roadside Development Awards by Dallas D. Dupre, Jr., Landscape Architect, and Herbert F. Yaekle, Division Landscape Architect, Ohio Department of Highways. In making the nomination, Mr. Dupre stated that the contractor was very cooperative in all phases of the work and made many suggestions and performed many items which were beyond the requirements of the contract. As the roadside improvement items were being completed in the late fall, the proximity of cold weather threatened the coverage of slopes with grass, and the possibility of the washing of topsoil and the freezing of sod. The contractor's efficient use of machinery permitted an earlier completion of the work and thereby insured a much better coverage of grass on the project for the winter than would have been possible otherwise.

A.E.D. Victory Seminar Elects New Officers

(*Photo on page 56*)

The Associated Equipment Distributors held their Victory Seminar of the Construction Equipment Industry at the Edgewater Beach Hotel, Chicago, Ill., January 11, 12 and 13. Outstanding speakers who discussed the problems of the industry included Major General Eugene Reybold, Chief of Engineers, U. S. Army, and Kinsey Merritt, Vice President and General Manager of Public Relations, Railway Express Agency, New York, who spoke at the Victory Luncheon attended by the many manufacturers at the January 12 session. The group of round-table discussions proved of unusual value and brought out a considerable exchange of information on various aspects of the industry's contribution to the war effort.

The new officers and directors for 1943, elected on January 11, are: Ed. P. Phillips, President; G. W. Van Keppel 1st Vice President; H. O. Penn, 2nd Vice President; Frank McBath, 3rd Vice President; W. W. Bucher, Treasurer; C. F. Winchester, Executive Secretary.

The Board of Directors includes: Region 1, Wm. Danner; Region 2, H. O. Penn; Region 3, James C. Alban; Region 4, Ed. P. Phillips; Region 5, A. E. Hahnan; Region 6, Chas. O. Finn; Region 7, R. S. Patten; Region 8, R. S. Rosholt; Region 9, G. W. Van Keppel; Region 10, Geo. A. Cooper; Region 11, John A. Beynon; Region 12, Frank McBath. With the exception of Regions 2 and 11, this is the same Board of Directors as served through 1942.

Novo Official, Chairman National Pump Bureau

The Contractors' Pump Bureau at its annual meeting in Chicago, early in January, appointed R. B. Harvey, Sales Manager, Novo Engine Co., Lansing, Mich., Chairman of the Bureau. The Pump Bureau is an organization composed of the principal manufacturers of contractors' pumps. It determines all standards of the manufacture of pumps used in the construction industry.

Mr. Harvey also has been appointed recently to the Contractors' De-watering & Supply Pump Manufacturers' Advisory Committee and the Air-Cooled Engine Industry Advisory Committee of the War Production Board. These committees were appointed to promote workable standards and greater simplification of procedure between the various manufacturers and the requirements of the War Production Board.

Pan American Highway And the Victory Effort

(Continued from page 23)

America. Recently, U. S. government agencies have sent many technicians to South America to stimulate increased production. It is expected that 40,000 tons of crude rubber will be produced in the other American republics in 1943, with progressive increases each year thereafter.

Ports of Accumulation

As a proposed partial solution of the transportation problem, a general movement of critical and strategic materials could emanate from Argentina and southern Brazil over the highways and accumulate westward through Chile and northward through Bolivia, Peru, Ecuador, Colombia and Venezuela, toward seaports situated on the Caribbean Sea and the port of Buenaventura on the Pacific coast of Colombia.

Secondary roads, airports and railways are built in and adjacent to this region and around the ports of Maracaibo and Puerto Cabello in Venezuela, and Baranquilla, Cartagena and Santa Marta in Colombia. Extension and improvement of these secondary roads could be speeded up and these roads coordinated with a system of river routes, airlines and railroads to make these Caribbean ports more accessible.

Ships crossing the Gulf of Mexico from these "ports of accumulation" could be docked in the southern United States and Mexico, from which points rail, river, plane or truck transportation could assume the final task of domestic distribution of products to inland industrial centers.

Conclusion

The Pan American Highway could thus compensate in part for our shipping losses, making it possible for the enormous tonnage and practically the entire convoying strength of the United Nations to be mobilized for shipping troops and supplies to open new fronts. With new battlefields rapidly developing, inter-American supply lines may have little or no protection against undersea attacks. Every mile of highway built and used now may mean the saving of lives, ships and vital cargoes of strategic materials for our war industries and our fighting fronts.

Get in the scrap! Steel production for the Victory effort can not be maintained at the necessary peak unless every bit of idle scrap is turned in. If you still have any scrap, turn it in NOW!

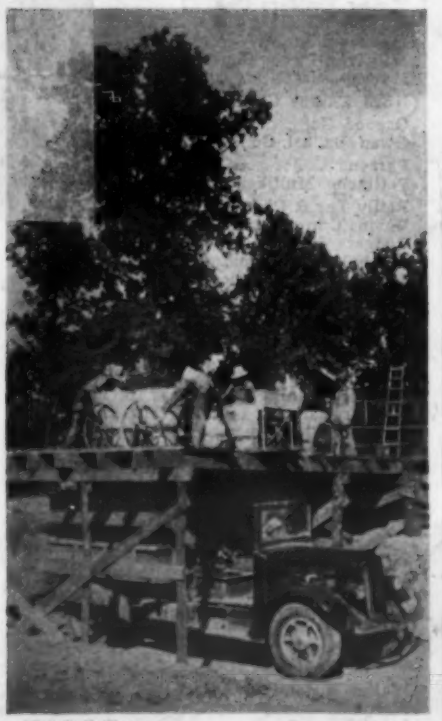
Index to Advertising

Contractors and Engineers Monthly

C. & E. M. Photos

Scenes in Connecticut's annual surface-treatment program. Above, a 1,300-gallon Etnyre distributor applying Tarvia; right, a close-up of the front-end spreader developed by the Department; extreme right, broom-dragging in the final operation. See page 33.

Below, the distributors' and manufacturers' luncheon at the Edgewater Beach Hotel in Chicago, held in conjunction with the Twenty-Fourth Annual Meeting of the Associated Equipment Distributors, designated this year as a Victory Seminar and devoted to wartime problems of the industry. See page 54.



C. & E. M. Photo

Bulk-cement handling with Johnson Kone-Karts, using bag cement because of lack of cement cars, for an access road to Fort Leonard Wood in Missouri. See page 9.

Below, W. K. Dinklage, Division Engineer, State Highway Commission of Kansas, in his office; and the attractive cut-stone office and garage building of Division 1 in Topeka. See page 13.

C. & E. M. Photos

C. & E. M. Photos

Above, details of the wood forms used for dual reflecting curb and, at right, the completed curbs forming the central mall on the new 2-mile cut-off at the north entrance to Denver, Colorado, via U. S. 85 and 6. See page 26.